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Salt Crystal Intergrowth in Efflorescence on Historic Buildings

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Abstract: Salt crystallisation is known to be one of the most powerful weathering factors threatening monuments, with the salts often occurring as efflorescence, normally formed from different species as individual salts growing in aggregates. In rare cases, different salt phases are observed that are closely intergrown on a crystalline scale. This paper reports on this rare type of salt efflorescence. Four types of salt crystal intergrowth in efflorescence have been distinguished up to now; the growth conditions for each are deduced.

Keywords: Crystallisation · Efflorescence · Historic buildings · Intergrowth · Salt

1. Introduction

Salt crystallisation is known to be one of the most powerful weathering factors, and therefore it is important that it is taken into consideration in the conservation of historic buildings. Salts are commonly noticed as efflorescence on buildings as a general weathering effect. Salt efflorescence forms by crystallisation from salt solutions. Though normally one predominant salt species is found in an efflorescence, there is frequently efflorescence of different species as individual salts growing in close proximity in aggregates. On the other hand, salt crystals in an efflorescence can be monocrystals as well as polycrystals. Whiskers in an efflorescence as an example (explanations for these and further specific terms see the end of the text) are frequently composed of parallel arrangements of crystal fibres tied or bundled together. Such polycrystalline individual whiskers are normally composed of one salt species only. However, in rare cases we observe this type of intergrowth formed from different salt minerals. This paper presents such observations, and it discusses their implications on the growth conditions in the specific context of weathering phenomena on building materials.

The salt species which grow in an efflorescence depend – as a matter of course – on the composition of the salt solution. In addition, it depends on the properties of the substrate and on the environmental conditions during growth. As a result of our observations on many historic buildings we found that

- one or several species may form from a solution containing several ionic species, and that
- the species variety may change even on the same place with time.

Hence we deal not only with chemically complex systems, but also with dynamically changing conditions during growth. For example on a wall surface, the physical and chemical conditions vary on a microscopic scale from place to place, and on the time scale according to the changing daytime and climatic influences. These systems are thermodynamically open as far as they include the whole atmosphere in their environment.

Cases of observed salt crystal intergrowth are specifically interesting since they may provide valid facts on the dynamics of crystallisation under particular conditions. They represent peculiar states near the equilibrium that have been established in the object, and they can be compared with theoretical findings from thermodynamic predictions as provided by Price [1].

2. Methodical Approach

2.1. *The Phenomenological Approach in Conservation* is used in our research. It is based on observation of the whole context (site, environment, situations, salt system, efflorescence, *etc.*). Efflores-

Table 1. The salts so far observed intergrowing in efflorescence with their solubility in water (after [5]) and the equilibrium relative humidity of the single salts (after [6]; extended thermodynamic data of salts can be found in Price [1]).

Salt mineral	Short name	Chemical formula	Solubility in water at 20°C [g/100ml]	Equilibrium relative humidity at 20 °C
Halite	Ha	$NaCl$	35.9	75.5%
Nitratine = soda niter	Nt	$NaNO_3$	92.1	75.4%
Niter	Ni	KNO_3	31.5	94.6%
Mirabilite	Mi	$Na_2SO_4 \cdot 10H_2O$	19.4	93.6%
Epsomite	Ep	$MgSO_4 \cdot 7H_2O$	71	90.1%
Gypsum	Gy	$CaSO_4 \cdot 2H_2O$	0.2	–

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cence occurring and disappearing on individual buildings or sites is correlated with monitored local environmental conditions, which allows specific ongoing damage mechanisms to be revealed. From this it is normally possible to derive custom-made concepts such as climate control to reduce or prevent further damage.

2.2. ***Qualitative Analyses*** of salts were performed according to the method given by Arnold [2]. It consists of analysing salt crystals by means of polarising light microscopy in combination with micro-chemical tests for specific ions in aqueous solutions of the salts. With regard to the analysis of crystalline materials, polarising light microscopy [3] is a very powerful tool because it not only allows the identification of individual species but also enables their shape, size and interconnections with other species such as crystals intergrown each other to be observed. Micro-chemical testing [4] is performed as a supplementary method to further distinguish salts with similar optical properties. With the combination of these methods the salts commonly occurring on monuments can be distinguished unambiguously with the exception of a few salt minerals. For the purpose of this paper, it is important to note that the method cannot differentiate epsomite ($MgSO_4 \cdot 7H_2O$) from hexahydrite ($MgSO_4 \cdot 6H_2O$). However, in the numerous cases where we analysed magnesium sulphate efflorescence by means of X-ray diffraction, we could only detect epsomite but never hexahydrite. For abbreviations and formulas of salt efflorescence occurring in this paper please refer to Table 1.

2.3. ***Quantitative Analysis*** of salts is performed by extracting the salts with water and analysing the ionic content of the solution with standard methods for water analysis such as IC, AAS and, in the case of Maria im Kapitol, with photometry (Lange) and use of a sodium ion selective electrode [7].

2.4. ***Climate Control,*** *i.e.* the assessment of the climatic conditions has been achieved at the different sites described hereafter in the course of investigations for several years. In the case of Maria im Kapitol (site 9) this was done by means of a hair hygrograph and by spot measurements with an aspiration psychrometer [8]. In all other cases electronic dataloggers (Testotherm) were used in addition to spot measurements (for further details

Table 2. Phenomenological description of particular cases referenced in this paper with the site (*i.e.* historic building where the efflorescence was found, site number in brackets), date of sampling, minerals setting up the intergrowth and the type of intergrowth, and further observa-

Site	Date	Type of intergrowth	Morphology
Crypt of Grossmünster, Zurich, Switzerland (1)	08.01.85	**Nt + Ha (a)**	The bristly efflorescence mainly consists of nitratine whereas halite only occurs in traces as bent fibres which are partly parallel intergrown with nitratine.
Crypt of Grossmünster, Zurich, Switzerland (2)	10.03.86	**Nt + Ha (a)**	Up to 0.6 mm long bundles of parallel grown fibres of niter and halite.
		Ni + Ha (a)	Bent bundles up to 0.3 mm long composed of parallel intergrown fibres of the two salt mineral species.
		Nt + Ni + Ha (a)	Bent bundles up to 0.4 mm long which are built up of parallel fibres of the mentioned three salt minerals (Fig. 1).
Cathedral of Chur, Switzerland (3)	11.01.00	**Nt + Ha (?a)**	Comb-like aggregates of ? parallel crystals of the two salt species. Intergrowth is not clearly identifiable in the sample which mainly consists of paint particles and powder from the mortar pushed off by salt crystallization.
Cathedral of Chur, Switzerland (4)	03.05.94	**Ni + Ha (a)**	The sample contains paint particles and powder and is rich in aggregates of halite grown parallel. Niter is present only in small amounts and partly parallel intergrown with halite.
Church of St. Martin, Cazis, Switzerland (5)	26.02.86	**Ni + Mi (?a)**	This intergrowth is not evident because the sample contains some droplets due to dehydration of mirabilite. Intergrowth may be the result of recrystallization.
Church of the Müstair Convent, Switzerland (6)	06.04.82	**Ni + Ep (a)**	Polycrystalline whisker up to 1mm long consisting of parallel intergrown fibres of niter and epsomite. Also Ni + Ep (c), see site 10.
Crypt of the Church St. Leonhard, Basel, Switzerland (7)	26.11.97	**Ni + Ha (b)**	Polycrystalline whisker of 0.1 up to 0.8 mm length with at maximum five alternating layers of parallel intergrown crystals of nitratine and halite (Fig. 2).
Norpert's Room in the Müstair Convent, Switzerland (8)	04.02.99	**Ni + Ha (b)**	Like site 7 but with only one layer of each salt mineral.
Crypt of St. Maria im Kapitol, Germany (9)	15.05.91	**Nt + Ha (c)**	Halite grains of cubic habit forming a crust with interstices filled by nitratine (Fig. 3).
Church of the Müstair Convent, Switzerland (10)	06.04.82	**Ni + Ep (c)**	Crust of compact grains of nitratine and epsomite which are irregularly intergrown.
Church of Lavin, Switzerland (11)	05.03.84	**Ni + Ep (c)**	As in the case of site 10.
Crypt of Grossmünster, Zurich, Switzerland (12)	09.03.82	**Ha + Nt inclusions (d)**	Fibres of halite up to 0.2 mm thick with inclusions of nitratine. See Fig. 4a and 4b.
Crypt of Grossmünster, Zurich, Switzerland (13)	10.03.86	**Ha + Nt inclusions (?d)**	Bent bundles of halite up to 0.15 mm long with inclusions of ?nitratine.

see bibliography related to the individual cases).

3. *In Situ* Observations

Because microscopic investigations of salt efflorescence are rather rarely undertaken, there are only few occurrences of crystal intergrowth in the literature. One case of oriented intergrown nitratine with halite is described in [9]. Throughout the practical work on many monuments we have observed multiphase crystal intergrowth in the cases discussed below (and Table 2 and Table 3).

3.1. *Morphology of Salt Crystal Intergrowth*

From the perspective of morphology and texture, four types (a to d) of multiphase crystal intergrowth have been distinguished in efflorescence up to now:

3.1.1. *Parallel Crystal Growth* of two (or three) different salt mineral species (Fig. 1a and 1b)

This type (which is common for monophase intergrowth) is reminiscent of oriented (over)growth or so-called epitaxy, a phenomenon which nowadays is used in industry to produce semiconductors. Substances involved in epitaxy often show analogous crystal structures or are even isostructural (but this does not have to be the case). A famous example for oriented growth of isostructural minerals is soda-niter (nitratine, $NaNO_3$) on calcite ($CaCO_3$) [10]. The NO_3^- groups are the same shape as the CO_3^{2-} groups and only slightly smaller in size. In the observed cases, parallel crystal growth is evidenced by the optical properties of the intergrown crystals. The crystal fibres of the different salt minerals show simultaneous extinction under crossed polarizers. We observed the following combinations of parallel crystal growth:

Nt + Ha, Ni + Ha: Soda-niter with halite, or niter with halite, were found to be the most frequent oriented crystal growth in efflorescence.

Ni + Ep, Ni + Mi (?): Intergrowth of niter with epsomite was detected in a few cases. Only one case of niter intergrowing with mirabilite was observed where it was ambiguous if intergrowth was really parallel to the crystallographic orientation. This case may have been influenced by alteration processes such as recrystallisation.

Nt + Ni + Ha: Oriented intergrowth of these three salt minerals occurred at a place where the combinations Nt + Ha and Ni + Ha were present as well.

Table 3. Characterization of the salt system and climatic conditions of crystallisation of each case (Table 2, site number in brackets). Where quantitative analyses of the salt system exist, the ionic composition is given in equivalent percentage of salt ions. Climatic conditions are indicated by the relative humidity and temperature of the period preceding the sampling, with W = weekly mean value, M = monthly mean value and Mm = minimal monthly mean value. For short names of salts see Table 1.

Site	Characterization of the salt system	Climatic conditions
(1)	As site 2	W = 37% / 15 °C M = 42% / 16 °C
(2)	Water extract from one sample of the plaster and mortar taken not from the place with the salt efflorescence and therefore with limited representativeness for the whole salt system: Na 4.93, K 3.32, Mg 4.66, Ca 51.02, Cl 17.32, NO$_3$ 9.90, SO$_4$ 8.85.	W = 42% / 13 °C M = 37% / 13 °C
(3)	At the same place over years occurred beneath Nt and Ha also Ni, temporarily all three salts alone. Qualitative analyses of water Cextracts from paint particles showed Ca and Mg in addition to these ions.	W = 51% / 13 °C M = 48% / 13 °C Mm = 48% / 12 °C
(4)	As site 3	W = 55% / 7 °C M = 53% / 6.5 °C Mm = 45% / 5 °C
(5)	In the old (autochthonous) salt system of the wall, no Mi, but Ni with Nt, Ep and Gy. Similar situation as in Lavin (11).	W = 77% / -2 °C M = 75% / -2 °C
(6)	Besides Ep and Ni much Nt occurs in the zone above. Nt is always found together with Gy, the latter in much smaller amounts. The concentrations of salt ions refer to water extracts from papers applied on the mural painting for desalination and are mean values from three successive desalinations in 1982 in the middle apsis, 1.3 m above soil: Na 13.59, K 6.73, Mg 8.99, Ca 2.78, Cl 23.48, NO$_3$ 43.43, SO$_4$ 1.00. As mentioned above, in a profile aside: Na 15.19, K 7.87, Mg 8.09, Ca 1.37, Cl 31.69, NO$_3$ 35.01, SO$_4$ 0.07. Salt ions in water extracts from papers for desalination in the north apsis in 1987, approximately 1.5 – 2m above soil: Na 15.44, K 6.66, Mg 18.73, Ca 1.99, Cl 36.33, NO$_3$ 19.05, SO$_4$ 1.79.	W= 55% / 13 °C M = 57% / 12 °C (estimations on the basis of measurements from 1983)
(7)	The principle salts occurring are Nt and Ha, in minor amounts Ni and Mi and sparsely Nesquehonite and Hydromagnesite.	
(8)	The salts occurring are Ha and Ni, frequently Nt, and Gy which is always present in much smaller amounts. The mortar contains a hygroscopic mixture mainly composed of Mg, Ca, Cl and NO$_3$ ions.	W = 65% / 2.5 °C M = 68% / 3 °C
(9)	The salts have been accumulated by rising damp. They originate from the ground, from salt that was stored in the room and from alkaline (Portland cement) materials. The measured ion concentrations are mean values from nine mortar analyses of the lower zone in an apsidiole: Na 18.08, K 0.33, Mg 9.46, Ca 17.20, Cl 44.38, NO$_3$ 8.95, SO$_4$ 1.60.	M = 55% / 18 °C Mm = 40% / 16 °C (estimations on the basis of measurements from 1992–94)
(10)	See under site 6	
(11)	Autochthonous salt system mixed with a younger one which originates from applied alkaline materials (water glass?). Occurring salts are Mi, Ep, Ni, Nt, Hydromagnesite and Nesquehonite.	W = 75% / 2 °C M = 78% / 2 °C
(12)	As site 2	W = 41% / 19 °C M = 42% / 18 °C
(13)	As site 2	As site 12

3.1.2. *Sequential Crystal Growth of Two Different Salt Minerals* which are parallel (Fig. 2a and 2b).

The salts we found of this type of crystal intergrowth are:

Nt + Ha, Ni + Ha: Each case was observed once only. In the Ni + Ha case, the crystal intergrowth is composed of a section of parallel fibres of niter grown on top of a section of parallel fibres of halite. The case of Nt + Ha intergrowth shows five alternating sections nitratine and halite respectively.

3.1.3. *Multiphase Aggregates* (Fig. 3a and 3b)

Multiphase aggregates are the normal case in igneous and metamorphic rocks. In efflorescence, they are formed as crusts in which one mineral phase may preponderate so that a second phase grows merely in the interstices between the crystals of the first phase. The interstitial phase therefore takes over the shape of the gaps (so-called xenomorphic or anhedral).

3.1.4. *Crystals with Solid Inclusions* (Fig. 4a and 4b)

Minute inclusions of one or more crystalline phases occurring as solid inclusions in preponderant crystalline phase is a rather frequent phenomenon.

3.2. *Characterization of the Related Situations and Environmental Conditions*

Weathering processes happen at particular places at a certain time with a specific effect and under distinct environmental conditions [11]. Different types and forms of salt crystallisation occur on the wall surfaces, depending on the salt content and the kind of substrate as well as on the environmental (climatic) conditions. Therefore, the intergrowth types which are referenced above can essentially be characterized by the salt systems they originate from, and by the salt crystallisation activity in relation to the climatic conditions during crystallisation. The types of intergrowth all are the result of coincident (simultaneous) crystallisation of two or more phases and hence can be discussed collectively for this perspective.

The *salt systems* that the presented intergrowth cases are based on can be divided into three groups:

1) The first (and most frequently observed) group is represented by the combination of *halite+nitratine* (cases 1, 2, 3, 7, 9, 12, 13 in Table 2 and 3). The related sites are: Crypt of Grossmünster Zurich,

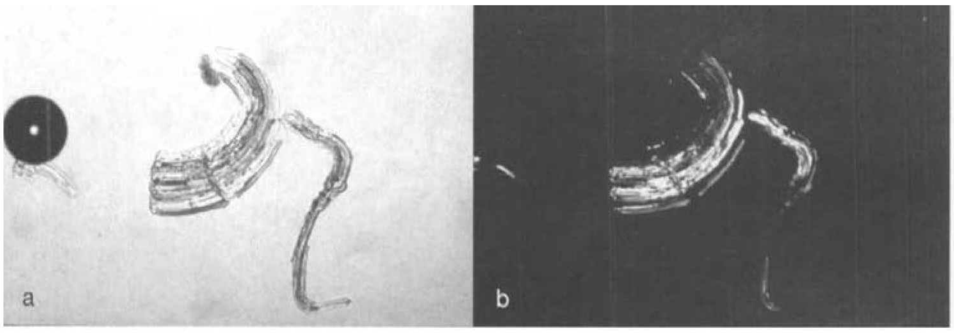

Fig. 1. Type (a) intergrowth. Efflorescence from the crypt of Grossmünster Zürich (site 2 in Tables 2 and 3) under the polarizing microscope (b under crossed polarizers). a) to the left, the curled bundle of parallel grown fibres (whiskers) of nitratine+niter+halite form a polycrystalline whisker which is about 150 µm thick and 500 µm long. The growth direction of this whisker was towards the lower left. The intersections perpendicular to the growth direction and the thinning towards the bottom of the crystal (upper end in the picture) indicate changing growth conditions. The whiskers thinned and finally stopped growing because the amount of solution supplied was constantly reduced. Image width 0.8 mm.

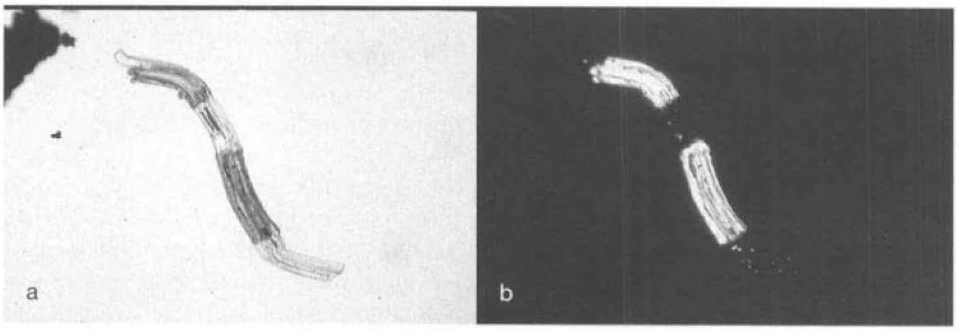

Fig. 2. Type (b) intergrowth. Bundle of parallel grown fibres of nitratine and halite under the polarizing microscope with parallel (left) and crossed (right) polarizers (sample from St. Leonhard church in Basel; site 7). Under crossed polarizers, the sections of nitratine show parallel extinction which indicates their parallel growth, whereas halite is isotropic (no birefringence). Note the small inclusions of nitratine (bright spots) in halite. Image width 0.8mm.

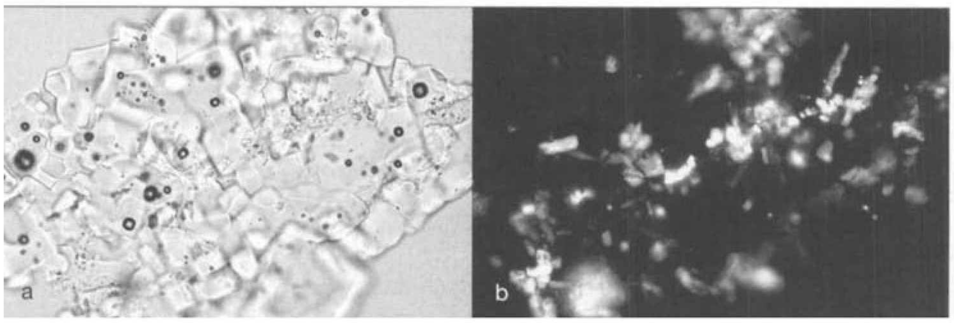

Fig. 3. Type (c) intergrowth. Efflorescence from the crypt of St. Maria im Kapitol in Cologne (site 9). The photographed aggregate of a salt crust is mainly composed of cubic halite grains (invisible under crossed polarizers in b) because it is isotropic) with inclusions of irregularly shaped nitratine in the interstices (birefringent and hence bright particles in b). Image width 0.3mm.

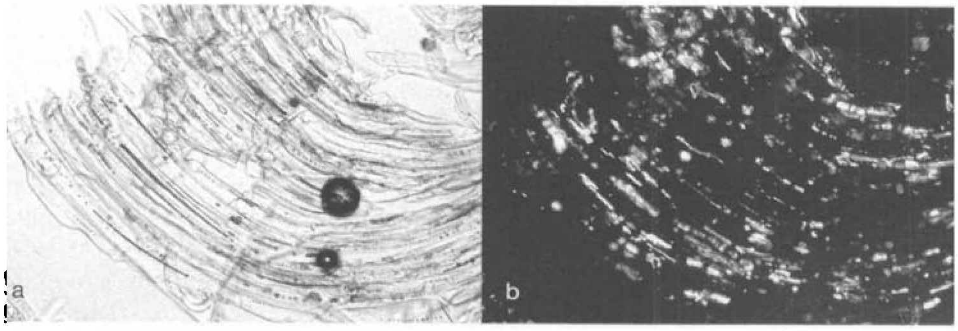

Fig. 4. Type (d) intergrowth. Efflorescence from the crypt of Grossmünster Zürich (site 12). A thick whisker (bundle) consists of parallel grown fibres of halite (only visible under parallel polarizers in a). The fibres are intergrown with inclusions of nitratine (bright spots in b) which are oriented in the growing direction as well. Image width 0.8mm.

cathedral of Chur, crypt of St. Leonhard church Basel, and crypt of St. Maria im Kapitol. With respect to the sites, this combination is occasionally associated with the combination *halite+niter* (cases 2 and 4). This latter combination is also present in case 8 (Norpert's room in the Müstair convent). In each of these cases, the basic problem which initiated our investigations was increased decay due to intensified crystallisation of salts on walls in the upper zone of rising damp. The ionic composition of such systems is broadly known in our regions [6]. It is a hygroscopic mixture with major portions of nitrate and chlorine. Rather hygroscopic saline minerals such as halite and nitratine crystallize from these systems as a consequence of drying by room heating. Chemical analyses of water extracts from mortars show that, in addition to the mineral-forming ions (Na^+, K^+, Cl^- and NO_3^-), Mg^{2+}, Ca^{2+} and SO_4^{2-} are accumulated in various but significant amounts as well (cases 2 and 9, Table 3).

2) The second group represents the combination of *niter+epsomite* (cases 6, 10 and 11). The related sites are the convent church of Müstair and the church of Lavin. Based on numerous investigations, this combination typically appears in the lower zone of rising damp which corresponds to the less soluble fraction of the solution rising from the ground [6]. In summary, it is characterized by a relative decrease of Cl^- and NO_3^- and an increase of SO_4^{2-}.

3) The combination of *niter+mirabilite* (case 5, St. Martin church in Cazis) is considered to result from the interference of the 'original' (autochthonous) salt system with recently introduced alkaline salts. As a matter of fact mirabilite has never been found in autochthonous salt systems. Thus it seems to be a rather complicated case, the dynamics of which are even more difficult to understand than in the other cases.

The *crystallisation activity in relation to the room climate* is best known for the combination of *halite+nitratine*: Crystallisation takes place as the relative humidity drops below a critical level of around 60%. This happened mainly as a consequence of room heating in the cold season. The temperature was usually between 12 °C and 16 °C during that period.

With the exception of case 2 the combination *halite+niter* was found at notably cooler climatic conditions of 2.5–7 °C room temperature, the corresponding relative humidity varying in the reverse sense between about 55% for higher temperatures and 65% for lower temperatures. In case 2, the climatic conditions were roughly the same as for halite+ nitratine (see above). However, as there are still too many unknown parameters in the systems, care has to be taken not to over-interpret these data.

The recorded climatic conditions for the combination *niter+epsomite* are not considered to be pertinent or may even be misleading, as we know from the real situations that crystallisation was influenced by additional humidity from the wall. Therefore it is very difficult to trace the real nano-climate. As a matter of fact, the equilibrium relative humidities of the pure solutions in consideration are much higher than the recorded relative humidities. We can only state that the conditions of crystallisation are moderately to rather humid compared to the cases mentioned above.

4. Interpretation

Crystal intergrowth is very common in rocks, stones, in ore deposits and in minerals. In our context, multiphase crystal intergrowth in salt efflorescence is a particular case of crystal growth in salt efflorescence. Differing from usual efflorescence, there are two (or more) phases crystallizing at the same place and, at least in some cases, at the same time. Thermodynamic models form the basis of an explanation of the conditions for simultaneous crystallisation of different salts. A first step has been undertaken to provide the necessary computer models [1]. The models do not, however, yet allow the calculation of real case systems of complex composition with all the ions present , nor do they take into account the dynamics of the real solution in partially saturated open pore systems, with ever-changing gradients, with influencing micro-organisms and further unknown parameters. By the phenomenological approach it is possible to deduce some aspects of the growth conditions from the morphology of crystal intergrowth observed in efflorescence.

By this approach, *type a)* must be seen as simultaneous crystal growth of different phases parallel to each other. This means that the supplied solution has to differentiate by some (unknown) means. A probable explanation is crystallisation at or close to the eutectic point. After initial nucleation of two phases, simultaneous growth may continue as long as the supplied solution (its composition and concentration) and the environmental conditions persist unchanged. Because of the known inhomogeneity and the small reservoir (patches of solution films) in the order of magnitude of the growing crystal or smaller, the solution composition may change strongly and very rapidly during crystallisation.

In *type b)* two phases grow one upon the other in the same whisker crystal. This represents clearly a sequence in time and a change in the composition of the supplied solution. Such a change in solution seems plausible for a composition around the eutectic mixture. The change is probably strongly related to the solution transport capacity within the porous support regarding salt solution supply from the interior and climatic changes. However, it seems to be uncertain whether such a crystal grows continuously or periodically, and if in the second case sequential growth is interrupted by times of stagnation or not.

Although it is the usual case for igneous and metamorphic rocks, *type c)* is ambiguous with respect to its morphology. It can be seen as an aggregate of different phases which crystallized either one beside the other or one after the other, or by a combination of both. Therefore, it merges into those rather frequent cases where the two salt species grow by individual crystals in an efflorescence at the same place. Type c) seems to be influenced by a subsequent process of recrystallisation. However, another possibility is crystallisation of the mixed aggregate within a single solution drop, where one phase (halite in Fig. 3a) crystallizes first and a second phase (nitratite Fig. 3b) fills the remaining interstices.

Type d), i.e. whisker crystals with inclusions of a different solid phase, resembles the formation of hollow inclusions in growing crystals. This phenomenon is well known, and we frequently observe hollows in whiskers from efflorescence. Hollows have been theoretically explained *e.g.* by Sunagawa [12] and experimentally established *e.g.* by Attolini *et al.* [13]. They are associated with the spiral growth mechanism at slightly increased supersaturation and represent a transition stage in the formation of hopper crystals (where edges grow faster than the centre of a crystal face) and skeletal growth, respectively. Our observations of solid inclusions *instead* of hollows – both being established at the same time – suggest that in this particular case the condition of hollow growth is combined with the condition stated for type a).

Explanations of Specific Terms

Autochthonous: A term used for salt systems with constituents that have formed *in situ* by natural weathering processes, and hence have not been introduced by treatments or later building interventions.

Crystalline habit: Outward appearance of a mineral, defined by the relative sizes and arrangement of characteristic crystal faces (definition from [14]). As an example, the specific crystal form of halite is a cube, and the equilibrium form is a more or less well-formed cube that grows in a solution more or less under equilibrium conditions. Prisms and needles of the same cubic halite are whisker habits of the same crystals growing out of a solution film.

Equilibrium habit: The shape a crystal takes when growing at low supersaturation.

Intergrowth: Aggregates of single crystals of one or several salt mineral species which occur either very closely together or in direct contact to each other in efflorescence. Sometimes the intergrowth follows the crystallographic orientation of the salt species. That means, the crystallographic orientation of the intergrown salts is the same for each individual crystal. Such oriented intergrowth is found to be formed only rarely by more than one salt mineral species. *Parallel intergrowth* is an intergrowth of two or more crystals in which one or more axes of each crystal are almost parallel.

Mineral names of salts: In this paper we use the mineralogical names of the salts which define the specific crystalline phase of a substance. Naturally occurring crystalline salts, like efflorescence, never consist of chemical pure substances (natural calcite, $CaCO_3$ normally contains strontium, iron or some other impurities). In addition, the same stoichiometry can apply to diverse minerals belonging to different crystal systems (*e.g.* $CaCO_3$ may form the minerals calcite or aragonite or vaterite).

Nano-climate: Refers to the climate in the immediate surroundings where crystallisation takes place (boundary layer climate at the wall surface).

Salt systems: Solutions of diverse ions in water. In building materials most frequently composed of two or more of the following components: Na^+, K^+, Ca^{2+}, Mg^{2+}, NH_4^+, NO_3^-, Cl^-, SO_4^{2-}, CO_3^{2-} and HCO_3^-.

Transformation of salts: Salts can undergo many transformations such as ageing, partial to complete dissolution or complete recrystallisation. Ageing at or near equilibrium relative humidity leads to the transformation from the growth form of the salt to its equilibrium form.

Types of efflorescence: Saline deposits on building surfaces that can be formed by more or less compact aggregates of crystals. *Bristly efflorescence* is composed of individually standing salt whiskers. *Salt crusts* are rather compact aggregates of one ore more salt mineral species having crystallized at or near to the substrate surface. The individual shapes of crystals forming the crusts are manifold, since they are influenced by external conditions (*e.g.* amount of supplied solution or 'wetness' of the surface) and by internal conditions of the salt species (*e.g.* equilibrium habit). Examples for types of efflorescence see [15–17].

Whisker growth: Acicular or hair-like crystals, sometimes growing straight but more often forming bent fibres or spirals. This habit is frequently taken by salt efflorescence on monuments regardless of the crystalline system of the salt. In this context, whisker growth indicates a moderately to slightly humid substrate from which crystals grow on a solution film into the air [17].

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SCHWEIZERISCHE CHEMISCHE GESELLSCHAFT
SOCIETE SUISSE DE CHIMIE
SWISS CHEMICAL SOCIETY

www.swiss-chem-soc.ch

New Members

Neue SCG-Mitglieder, Oktober 2001

Adi, Alfred, Legon (Ghana)
Alameddine, Bassam, 1700 Fribourg
Aldag, Caroline, 8044 Zürich
Andrey, Olivier, 1297 Founex
Avrcggi, Valentin, 2000 Neuchâtel
Bader, Reto, Dr., 8037 Zürich
Bas, Delphine, 1211 Genève 4
Beaufils, Florent, 1700, Fribourg
Benhaim, Cyril, 1227 Carouge
Bouchez, Laure, 1020 Renens
Bürgi, Stephan, 4056 Basel
Chesnov, Sergiy, 8051 Zürich
Clouet, Anthony, 3012 Bern
Cox, Jenny, 8092 Zürich
Darbre, Tamis, Dr., 3063 Ittingen
Eggertswyler, Christophe, 1752 Villars-sur-Glâne
Fadini, Luca, 8037 Zürich
Ferri, Davide, 8006 Zürich
Fibbioli, Monia, 6834 Morbio Inf.
Fonquerne, Freddy, 1020 Renens
Gacond, Sabine, 2202, Chambrelien
Gerber-Lemaire-Audoire, Sandrine, Dr., 1015 Lausanne
Gerdes, Gerd, 8032, Zürich
Giger, Thomas, Dr., 9470 Werdenberg
Gottselig, Michael, 8093 Zürich
Hildbrand, Stefan, Dr., 4125 Riehen
Hoegger, Daniela, 1004, Lausanne
Hu,Wenqing, Dr., 8055 Zürich
Kimmerlin, Thierry, 8032 Zürich
Knopff, Oliver, Dr., 1205 Genève
Lanaspeze, Sébastien, 2000 Neuchâtel
Loiseleur, Olivier, Dr., F-68300 St-Louis
Loy, Maxime, 1700 Fribourg
Nicolet, Olivier, 1700 Fribourg
Nielsen, John, Dr., DK-2800 Kgs. Lyngby
Ohlin, Christian A., 1010 Lausanne
Pelet, Serge, 1006 Lausanne
Petraglio, Gabriele, 6828 Balerna
Piccardi, Riccardo, 3027 Bern
Planchenault, Denis, Dr., 1004 Lausanne
Popowycz, Florene, 1020 Renens
Prikoszovich, Walter, Dr., 4124 Schönenbuch
Rossier, Joël, Dr., 1860, Aigle
Scheuplein, Stefan, Dr., 4303 Kaiseraugst
Seuret, Patrick, 1207, Genève
Skalicky, Tomas, 1700 Fribourg
Sobota, Radoslaw, 2009 Neuchâtel
Solcà, Nicola, 4056 Basel
Stamm, Simon, 8200, Schaffhausen
Terenzi, Silvia, 4056 Basel
Verpoorte, Sabeth, 2000 Neuchâtel
Wüst, Thomas, 8200 Schaffhausen
Wüstenberg, Bettina, 4056 Basel
Zaza, Philippe, Dr., 1870, Monthey
Zencak, Zdenek, 4056, Basel

DAC Division of Analytical Chemistry

FLB SCG **DAC** SCV SLV
CCCTA
Weiterbildung Analytik

Unsere nächsten Veranstaltungen

In den Monaten Dezember – Februar organisieren wir teils
in der Deutschschweiz
teils **im Tessin** und
in der Westschweiz
folgende Veranstaltungen:

Kurse über Qualitätssicherung und Arbeitsplanung:

QS-5d Qualitätsmanagement 1: Business Excellence, EFQM Modell
Ziel
Kennenlernen des EFQM Modells für Business Excellence und der Selbstbewertungsmethoden anhand praktischer Übungen und Erarbeitung der Grundzüge einer organisationsspezifischen Vorgehensweise.
Referent
Dr. Imo Töpfner, ITAC Assessments & Coaching, 5452 Oberrohrdorf
Ort/Termin
Fachhochschule Aargau, Windisch/10.–11. Dezember 2001

QS-6d Qualitätsmanagement 2: Benchmarking
Ziel
Rolle des Benchmarkings (BM) zur Weiterentwicklung von Organisationen, Kennenlernen der BM Phasen und Arten, Wissen um die Voraussetzungen für ein erfolgreiches BM Projekt und die notwendigen Veränderungen innerhalb der Organisation.
Referent
Dr. Imo Töpfner, ITAC Assessments & Coaching, 5452 Oberrohrdorf
Ort/Termin
Fachhochschule Aargau, Windisch/12.–13. Dezember 2001

QS-7d GMP im Labor
Ziel
Kennen und Verstehen der FDA-konformen Labororganisation und Dokumentation

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Ort/Termin
Fachhochschule Aargau, Windisch/10.–11. Dezember 2001

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Ort/Termin
Fachhochschule Aargau, Windisch/12.–13. Dezember 2001

QS-7d GMP im Labor
Ziel
Kennen und Verstehen der FDA-konformen Labororganisation und Dokumentation

Referent
Dr. Josef Kuenzle, Chief Quality Officer CARBOGEN AG, 5001 Aarau
Ort/Termin
Fachhochschule Aargau, Windisch/23. Januar 2002

AP-3e Successful Project Leadership
Objective
You will
- get to know the requirements regarding leadership- and team attitude in the different project phases
- gain insight into your own personal strengths and weaknesses
- learn the requirements for the management of change in special project situations

Facilitator/Course Leader
Peter Corbat, Management Consulting Cockpit, Sisseln
Location/date
Monte Verita, near Ascona/6.–7. December 2001

Veranstaltungen über analytische Anwendungen

AA-2d Chromatographische Reinigung von Proteinen
Ziel
Sie eignen sich die praktischen Fähigkeiten an, Proteine zu reinigen und zu charakterisieren.
Referent
Dr. Roland Looser, Novartis Pharma AG, Basel
Ort/Termin
Berner Fachhochschule, Burgdorf/27.–28. November 2001

AA-3d Bioanalytik mit Massenspektrometrie
Ziel
Sie kennen die neusten Entwicklungen und wichtigsten Anwendungen der Massenspektrometrie in der Bioanalytik ('Proteomics') und können die entsprechenden Massenspektren interpretieren.
Referent
Dr. Martin Schär, Berner Fachhochschule, Burgdorf
Ort/Termin
Berner Fachhochschule, Burgdorf/25. Januar 2002

AA-4d Molekularbiologische Analysentechniken in der Lebensmittelkontrolle
Ziel
Sie sind in der Lage anhand von Fallbeispielen Lebensmittel wirksam zu prüfen
Referent
Dr. Peter Brodmann, Kantonales Labor, Basel-Stadt
Ort/Termin
Berner Fachhochschule, Burgdorf/ 14. Februar 2002

AA-6f Techniques de dérivatisation des échantillons biologiques
But
Vous comprendrez les méchanismes et les différentes techniques de dérivatisation utilisées pour l'optimalisation de l'analyse chromatographique.
Enseignant
Laurent Rivier, Prof. à l'Institut Universitaire de Médecine Légale (IUML) à Lausanne
Lieu/Date
IUML, Lausanne, le 15. janvier 2002

AA-7f Préparation d'échantillons
But
Vous comprendrez les techniques de séparation par transfert de phase et par changement d'état.
Enseignant
Jean-Luc Veuthey, Prof. à l'Université de Genève
Lieu/Date
HUG, Genève, le 18. février 2002

Chromatographiekurs

GC-2d GC für Fortgeschrittene
Ziel
Sie sind mit den wichtigsten theoretischen Aspekten der GC sowie mit den aktuellsten praktischen Möglichkeiten vertraut.
Referent
Dr. Adolf Wehrli, SCG-DAC, Frick
Ort/Termin
Fachhochschule Aargau, Windisch /21.–22 Januar 2002

Falls Sie sich für unsere Veranstaltungen interessieren, verlangen Sie mit dem angehängten Talon unsere Gratisbroschüre <Weiterbildung Analytik 2001/2002> oder informieren Sie sich über unsere Veranstaltungen im Internet unter:

www.sach.ch

mit freundlichen Grüssen
Der Weiterbildungsausschuss der DAC/SCG

Bestellung von Informationsmaterial

- Ich bitte um Zustellung der WEITERBILDUNGSBROSCHÜRE 2001/2002 (Anzahl........) ☐
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K-1354.3.06 Fax: 061 696 69 85
CH-4002 Basel E-Mail: scg.etter@pharma.novartis.com

INFORMATION

Lectures

Berner Chemische Gesellschaft

Mittwoch, 16.30 Uhr
Hörsaal EG 16
Departement für Chemie und Biochemie, Freiestr. 3
(Kaffee um 16.10 Uhr vor dem Hörsaal)

5. Dez. 2001	Prof. *Jean-Louis Reymond* Departement für Chemie und Biochemie, Universität Bern 'Enzymes and Abzymes'

Société Fribourgoise de Chimie (SFC)
Freiburger Chemische Gesellschaft (FCG)

Tuesday, 17.15 h
Grand Lecture Hall, Chemistry Department, University of Fribourg at Pérolles

Dec. 11, 2001	Prof. *Andreas Pfaltz* Departement für Chemie, Universität Basel 'Recent Developments in Asymmetric Catalysis'

Chemische Gesellschaft Zürich

jeweils am Mittwoch, 17.15 Uhr
Hörsaal HCI G3, ETH-Hönggerberg, Chemiegebäude

12. Dez. 2001	Prof. Dr. *Ferdi Schüth* Max-Planck-Institut für Kohlenforschung, Mühlheim, Deutschland 'High-Throughput Experimentation in Heterogenous Catalysis'

Institut für Organische Chemie der Universität Basel

Freitag, 10.45 Uhr
Kleiner Hörsaal, St. Johanns-Ring 19

7. Dez. 2001	Prof. *John E.T. Corrie* National Institute for Medical Research, London 'Developments in the Chemistry of Photolabile Precursors of Biologically Active Compounds'
14. Dez. 2001	Prof. *Hans Puxbaum* Technische Universität Wien 'Neue Methoden zur Analyse des atmosphärischen Aerosols'

Institut für Physikalische Chemie der Universität Basel

Mittwoch, 16.30 Uhr
Kleiner Hörsaal (2. Stock)
Klingelbergstrasse 80

5. Dez. 2001	Dr. *A. Dedieu* Laboratoire de Chimie Quantique, CNRS, Université Louis Pasteur, Strasbourg, France 'Van der Waals Type Interactions of CO_2 with Ligands of Transition Metal Complexes: *Ab-initio* Studies'
12. Dez. 2001	Prof. Dr. *F. Merkt* Laboratorium für Physikalische Chemie, ETH Zürich 'Rare Gas Dimers and their Ions'

Departement für Chemie und Biochemie der Universität Bern Seminare in Anorganischer, Analytischer und Physikalischer Chemie

Donnerstag, 11.15 Uhr, Hörsaal 481, Freiestr. 3

6. Dez. 2001	Prof. *Alan Williams* Département de Chimie Inorganique, Analytique et Appliquée, Université de Genève 'A New Twist to Helicate Chemistry'
13. Dez. 2001	Prof. *Ken'ichi Kuge* Dept. of Information and Image Science, Chiba University, Japan (zur Zeit im Hause) 'Roles of Silver, Gold and Sulfide Clusters in the Photographic Process'

Departement für Chemie und Biochemie der Universität Bern Seminare in Organischer Chemie und Biochemie

Montag, 16.30 Uhr, Hörsaal 379, Freiestrasse 3
http://www.dcb.unibe.ch

4. Dez. 2001 Dienstag Hörsaal EG 16	Prof. *Christopher A. Hunter* Department of Chemistry, University of Sheffield, UK 'Quantitative Approaches to Molecular Recognition'
10. Dez. 2001	Dr. *Simon A. Jones* Cardiff School of Biosciences, Cardiff, UK 'Regulation of Leukocyte Recruitement During Inflammation by IL-6 and its Soluble Receptor'

Département de Chimie Organique, Université de Genève

Auditoire A-100, Sciences II, 16h30
30, quai Ernest Ansermet, Genève

Mercredi 5 décembre 2001	Prof. *Christopher A. Hunter* Department of Chemistry, University of Sheffield, Sheffield, UK 'Quantitative Approaches to Molecular Recognition'

Institut de Chimie, Université de Neuchâtel

Lundi 3 décembre 2001 heure à définir salle définir	Colloque du 3ème cycle Prof. *Nigel Seaton* University of Edinburgh (Royaume-Uni) 'Le titre sera annoncé plus tard'

Mardi
4 décembre 2001
10 h 30
Petit Auditoire
Colloque du 3ème cycle
Prof. *Nigel Seaton*
University of Edinburgh (Royaume-Uni)
'Le titre sera annoncé plus tard'

Mercredi
5 décembre 2001
heure à définir
salle définir
Colloque du 3ème cycle
Prof. *Nigel Seaton*
University of Edinburgh (Royaume-Uni)
'Le titre sera annoncé plus tard'

Jeudi
6 décembre 2001
heure à définir
salle définir
Colloque d'institut
Prof. *John Gladysz*
Universität Erlangen-Nürnberg (Allemagne)
'From sp Carbon Chains to sp^3 Carbon Double Helices: How to Insulate a Molecular Wire'

Mercredi
19 décembre 2001
10 h 30
Petit Auditoire
Colloque d'institut
Prof. *Kai Johnsson*
Université de Lausanne
'Using Organic Chemistry and Directed Evolution to Manipulate Proteins: Studies on Peroxidases and O6-Alkylguanine-DNA-Alkyltransferase'

Laboratorium für Organische Chemie der ETH Zürich

Montag, 16.30 Uhr
Hörsaal HCI J3
ETH Hönggerberg, 8093 Zürich

17. Dez. 2001
Prof. Dr. *Albert Eschenmoser*
Laboratorium für Organische Chemie der ETH Zürich und Scripps Research Institute, La Jolla, USA
'Warum RNA?'

Organisch-chemisches Institut der Universität Zürich

Dienstag, 17.15 Uhr
Hörsaal O3-G-91
Winterthurerstrasse 190, Zürich-Irchel (siehe auch www.unizh.ch/oci)

4. Dez. 2001
Prof. Dr. *Luis Moroder*
Max-Planck-Institut für Biochemie, AG Bioorg. Chemie, Martinsried, D
'Synthetic Heterotrimeric Collagenpeptides as Mimics of Collagen in ECM Turnover and Cell-Adhesion Processes'

11. Dez. 2001
Prof. Dr. *Kai Johnsson*
Institut of Organic Chemistry, University of Lausanne
'Using Organic Chenistry and Directed Evolution to Manipulate Proteins: Studies on Peroxidases and O^6-Alkylguanine-DNA Alkyltransferase'

18. Dez. 2001
Dipl. Chem. *Stefan Furegati*
Organisch-chemisches Institut, Universität Zürich (Gruppe Prof. Rüedi)
'Synthese und Charkaterisierung von Organophosphor-Acetylcholinmimetika als Inhibitoren der Acetylcholinesterase'

Physikalisch-chemisches Institut der Universität Zürich

Donnerstag, 10.15 Uhr
Seminarraum 34-K-01
Winterthurerstrasse 190, 8057 Zürich

6. Dez. 2001
Dr. *Victor Volkov*
Osaka University
'Backbone Optical Response in Poly-DCHD Microcrystalline Species'

13. Dez. 2001
Achim Lenenbach
Physikalisch-Chemisches Institut UNIZH
'Neue Methoden der fluoreszierenden Diagnostik für den Einsatz in der onkologischen Therapieplanung und der minimal invasiven Laserchirurgie im Gehirn'

20. Dez. 2001
Stefan Jung
Physikalisch-Chemisches Institut UNIZH
'DNA Sizing auf silanisierten Oberflächen'

Biochemische Institute beider Zürcher Hochschulen

Donnerstag, 17.00 Uhr
Uni: Winterthurerstrasse 190, Zürich-Irchel, Hörsaal 85
ETH: Universitätstrasse 16, ETH Zentrum, Seminarraum CHN N 23

6. Dez. 2001
Uni BC
Dr. *Liisa Holm*
EBI-Hinxton, Caymbridge, UK
'Bioinformatics of Protein Structure'

13. Dez. 2001
ETH BC
Dr. *Frank Lyko*
Deutsches Krebsforschungszentrum, Heidelberg, D
'The Function of Eukaryotic DNA Methylation'

20. Dez. 2001
Uni BC
Dr. *Wolfram Welte*
Fachbereich Biologie, Universität Konstanz, D
'Active Transporters across the Bacterial Outer and Inner Membrane. Hints for Mechanisms from Atomic Structures'

Novartis-Chemistry Lectureship 2001/2002

Location: Novartis Pharma AG, Auditorium Horburg, WKL-430.3.20
Müllheimerstr. 195, CH-4057 Basel
Time: 10.30 am ('Get Together': 10.00 am)

Dec. 5, 2001
Prof. *J.E. Baldwin*
Oxford University, UK
'Recent Mechanistic and Structural Studies on β-Lactam Biosynthesis'

Jungchemikerforum Basel
Club des Jeunes Chimistes à Bâle
Basel Young Chemists' Committee

Freitag
14. Dez. 2001
ab 17 Uhr
Weihnachtsfeier des Jungchemikerforums Basel im Foyer vor der Hörsälen des Instituts für Organische Chemie, Universität Basel, St. Johanns-Ring 19, 4056 Basel

News

Europäische Forschungszusammenarbeit COST Schweizerin zur Vizepräsidentin gewählt

Die schweizerische COST-Koordinatorin Eva Klaper ist im Oktober zur Vorsitzenden der Arbeitsgruppe JAF (*Legal, Administrative and Financial Affairs Group*) des Leitungsgremiums (*Commitee of Senior Officials – CSO*) von COST gewählt worden. Damit wird sie zugleich Vizepräsidentin von COST. Eva Klaper erhielt 17 Länderstimmen und konnte sich damit gegen Milos Chvojka vom tschechischen Ministerium für Bildung, Jugend und Sport durchsetzen, der sechs Länderstimmen erhielt.

Thales Technologies entdeckt neuen Katalysator für asymmetrische Hydrierung

Thales Technologies in Zürich hat eine neuartige Schlüsselstruktur eines vielseitigen Katalysators für asymmetrische Hydrierungen in Prozessen der pharmazeutischen, Fein- und Spezialitätenchemie entdeckt. Der neue Katalysator weist ein grosses Potenzial zur Vereinfachung, Verkürzung und Verbilligung industrieller Produktionsprozesse auf und wird zur Zeit intensiv optimiert. Die Markteinführung des Katalysators zur Lizenzierung wird in der nahen Zukunft erwartet. Thales Technologies erfand die innovative katalytische Struktur durch Mechanismus-basiertes Design nach detailliertem Studium der aktiven Spezies in der Hydrierreaktion.

Neben der Lizenzierung eigener Katalysatoren bietet Thales Technologies Dienste und Kooperationen in schnellem High-Throughput-Screening mit raffinierten massenspektrometrischen Methoden an und führt kundenspezifische mechanistische und kinetische Untersuchungen für alle katalytischen Reaktionen durch.

Kontakt: Thales Technologies AG, Technoparkstr. 1, CH–8005 Zürich; Tel.: +41 1 445 12 16; Fax: +41 1 445 12 17; info@thalestech.com <mailto:info@thalestech.com>; www.thalestech.com <http://www.thalestech.com>

Lonza Group Expanded its Ozonolysis Capacity

Basel, October 11th, 2001 – Lonza Group's Business Sector Exclusive Synthesis has recently expanded its ozonolysis capacity by installing a new ozone generator with 8 kg/h capacity, a continuous ozonolysis reactor and a multipurpose train for downstream processing at its Launch Plant in Visp, Switzerland. This set-up allows the manufacture of several hundred tonnes of intermediates per year.

The fully automated facility has successfully come on stream in the first half of 2001 and is designed for ozonolysis at low temperatures in particular. The short residence times allow higher selectivity and the handling of unstable intermediates.

Lonza has been performing ozonolysis for high-value-added intermediates since 1987 using semi-batch processes. Ozone is a versatile oxidizing agent that is mostly used to introduce oxygen in unsaturated and saturated hydrocarbons. In general the molecule itself generates no other side products apart from oxygen allowing the application of economical and environmentally friendly processes.

For further information please contact:
Dr. Walter Eschenmoser
Communications/Investor Relations
Tel.: + 41 61 316 83 63
Fax. + 41 61 316 82 20
walter.eschenmoser@lonzagroup.com

Brendan Cummins wird neues Mitglied der Konzernleitung bei Ciba Spezialitätenchemie

17. Oktober 2001 – Der Verwaltungsrat von Ciba Spezialitätenchemie hat Brendan Cummins zum neuen Leiter Internationale Koordination und Human Resources und Mitglied der Konzernleitung von Ciba Spezialitätenchemie ernannt. Cummins (50), irischer Staatsbürger, war bei Ciba in verschiedenen führenden internationalen Positionen tätig, unter anderem als Leiter der Region China und Leiter der Geschäftseinheit Home and Personal Care von Ciba Spezialitätenchemie. Zuletzt war er Managing Director von Irish Fertilizers der nach 40jähriger erfolgreicher Tätigkeit bei Ciba-Geigy und Ciba Spezialitätenchemie in den Ruhestand tritt.

Für weitere Informationen wenden Sie sich bitte an:

Medien	Investor Relations
Thomas Gerlach	Matthias A. Fankhauser
Tel: + 41 61 636 44 44	Tel: +41 61 636 5081
Fax: +41 61 636 30 19	Fax: +41 61 636 5111

Honors/Ehrungen

Prof. Dr. *François Diederich*, Laboratorium für Organische Chemie, ETH Zürich, ist vom französischen Forschungsministerium für die Dauer von vier Jahren in den Wissenschaftsrat des Centre National de la Recherche Scientifique (CNRS) gewählt worden.

Prof. Dr. *Dieter Seebach*, Laboratorium für Organische Chemie, ETH Zürich, ist zum Corresponding Member der Aademia Mexicana de Ciencias (AMC) gewählt worden.

News

Europäische Forschungszusammenarbeit COST Schweizerin zur Vizepräsidentin gewählt

Die schweizerische COST-Koordinatorin Eva Klaper ist im Oktober zur Vorsitzenden der Arbeitsgruppe JAF (*Legal, Administrative and Financial Affairs Group*) des Leitungsgremiums (*Commitee of Senior Officials – CSO*) von COST gewählt worden. Damit wird sie zugleich Vizepräsidentin von COST. Eva Klaper erhielt 17 Länderstimmen und konnte sich damit gegen Milos Chvojka vom tschechischen Ministerium für Bildung, Jugend und Sport durchsetzen, der sechs Länderstimmen erhielt.

Thales Technologies entdeckt neuen Katalysator für asymmetrische Hydrierung

Thales Technologies in Zürich hat eine neuartige Schlüsselstruktur eines vielseitigen Katalysators für asymmetrische Hydrierungen in Prozessen der pharmazeutischen, Fein- und Spezialitätenchemie entdeckt. Der neue Katalysator weist ein grosses Potenzial zur Vereinfachung, Verkürzung und Verbilligung industrieller Produktionsprozesse auf und wird zur Zeit intensiv optimiert. Die Markteinführung des Katalysators zur Lizenzierung wird in der nahen Zukunft erwartet. Thales Technologies erfand die innovative katalytische Struktur durch Mechanismus-basiertes Design nach detailliertem Studium der aktiven Spezies in der Hydrierreaktion.

Neben der Lizenzierung eigener Katalysatoren bietet Thales Technologies Dienste und Kooperationen in schnellem High-Throughput-Screening mit raffinierten massenspektrometrischen Methoden an und führt kundenspezifische mechanistische und kinetische Untersuchungen für alle katalytischen Reaktionen durch.

Kontakt: Thales Technologies AG, Technoparkstr. 1, CH–8005 Zürich; Tel.: +41 1 445 12 16; Fax: +41 1 445 12 17; info@thalestech.com <mailto:info@thalestech.com>; www.thalestech.com <http://www.thalestech.com>

Lonza Group Expanded its Ozonolysis Capacity

Basel, October 11th, 2001 – Lonza Group's Business Sector Exclusive Synthesis has recently expanded its ozonolysis capacity by installing a new ozone generator with 8 kg/h capacity, a continuous ozonolysis reactor and a multipurpose train for downstream processing at its Launch Plant in Visp, Switzerland. This set-up allows the manufacture of several hundred tonnes of intermediates per year.

The fully automated facility has successfully come on stream in the first half of 2001 and is designed for ozonolysis at low temperatures in particular. The short residence times allow higher selectivity and the handling of unstable intermediates.

Lonza has been performing ozonolysis for high-value-added intermediates since 1987 using semi-batch processes. Ozone is a versatile oxidizing agent that is mostly used to introduce oxygen in unsaturated and saturated hydrocarbons. In general the molecule itself generates no other side products apart from oxygen allowing the application of economical and environmentally friendly processes.

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Brendan Cummins wird neues Mitglied der Konzernleitung bei Ciba Spezialitätenchemie

17. Oktober 2001 – Der Verwaltungsrat von Ciba Spezialitätenchemie hat Brendan Cummins zum neuen Leiter Internationale Koordination und Human Resources und Mitglied der Konzernleitung von Ciba Spezialitätenchemie ernannt. Cummins (50), irischer Staatsbürger, war bei Ciba in verschiedenen führenden internationalen Positionen tätig, unter anderem als Leiter der Region China und Leiter der Geschäftseinheit Home and Personal Care von Ciba Spezialitätenchemie. Zuletzt war er Managing Director von Irish Fertilizers der nach 40jähriger erfolgreicher Tätigkeit bei Ciba-Geigy und Ciba Spezialitätenchemie in den Ruhestand tritt.

Für weitere Informationen wenden Sie sich bitte an:

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