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Spectral Hole-Burning: Information Storage and Processing

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Spectral hole-burning is a special type of photochemistry which can be applied to store information in a dye doped polymer film at cryogenic temperatures. It does not only allow high-resolution spectroscopy but also opens a wide field of technical applications, especially with respect to frequency selective information storage. Recently, more than 2000 images have been stored in a single sample at different frequencies of the visible spectrum. The information stored will be displayed in the

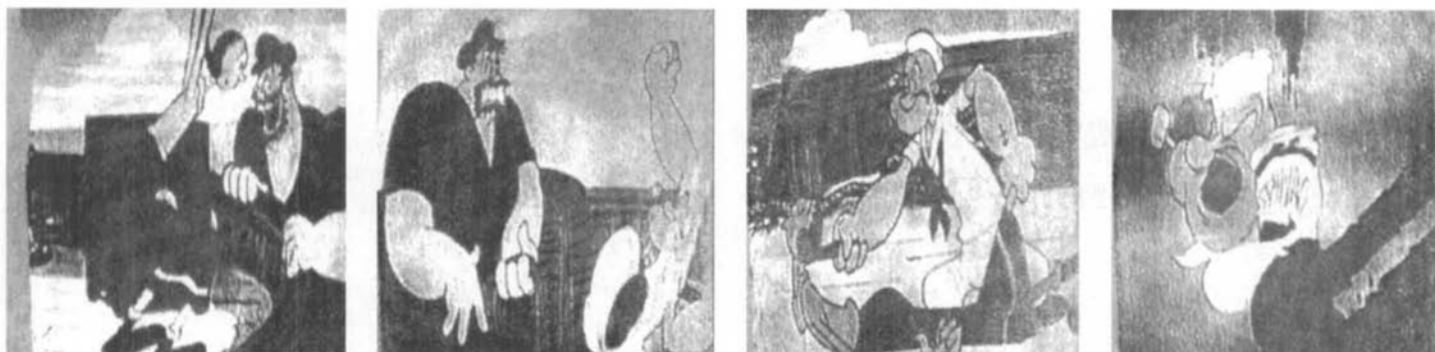
form of a movie. In addition, a short three-dimensional 'holographic movie' has been realized.

Spectral hole-burning holography can also be used to process pages of recorded information. This novel technique, known as 'molecular computing', involves Stark splittings and precise phase control of the recorded holograms. Its enormous storage capacity and parallel processing ability make hole-burning holography a unique data-processing tool.

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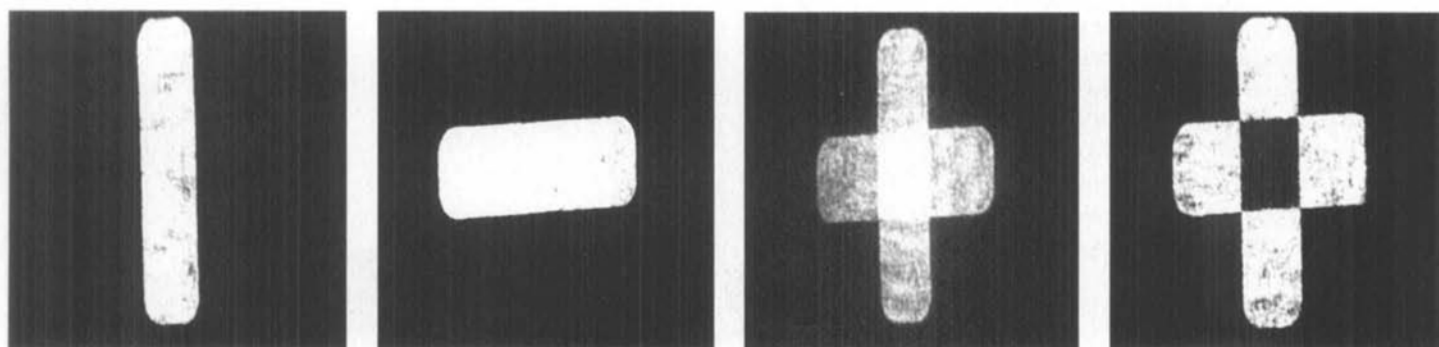
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Holographic Image Storage



Combining spectral hole-burning and holography facilitates parallel recording and data access. Selected images of a 2100 image video movie recorded in a chlorin doped polymer film at 2 K are shown.

Molecular Computing



Direct correlation of stored image information in the sample is based on the interaction of molecular energy levels with an externally applied electric field and the interferometric properties of holography. The result of the superposition depends on the relative phase of the holograms and can be constructive or destructive.