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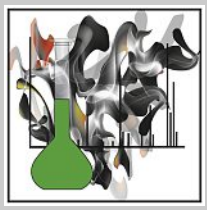

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Assessment of the Chemical Evolution of E-Cigarette Droplets

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The electronic cigarette (e-cigarette) industry is a fast-growing industry, already representing a multi-billion-dollar market. E-cigarettes deliver nicotine to the user through droplets generated from an e-liquid. E-cigarettes hence represent an alternative to conventional tobacco products. The health impact of e-cigarettes is still debated among scientists. Despite numerous studies on e-cigarette droplets, certain aspects remain largely unexplored.

In this study, we addressed two key aspects of e-cigarette droplets: the time evolution of their chemical composition and the partitioning of their main constituents between the droplet and gas phase. For this, *in situ* Raman scattering measurements were performed on single e-cigarette droplets isolated in air by using an optical trap. Thereby, we were able to measure the time evolution of the concentrations of the main compounds in the e-cigarette droplet phase separate from those in the gas phase. The results demonstrated that the chemical composition of the e-cigarette droplets undergoes major changes on a time scale of a few to some 10 s. More than 50% of the total mass of the e-cigarette droplets evaporates within 20 s. Moreover, the pH of the e-liquid dictates the time evolution of the nicotine concentration inside the generated e-cigarette droplets. When an e-liquid with acidic pH is used, nicotine remains in the generated e-cigarette droplets, while, under basic pH, nicotine completely evaporates from the droplets within ~20 s.

Such destruction-free *in situ* measurements of single particles are opening up new perspectives for further research on e-cigarette droplets and e-liquid manufacturing. **The measured partitioning of the main e-cigarette compounds between the droplet and gas phase as a function of time will improve our understanding of their deposition in the respiratory tracts and hence of their impact on health.**

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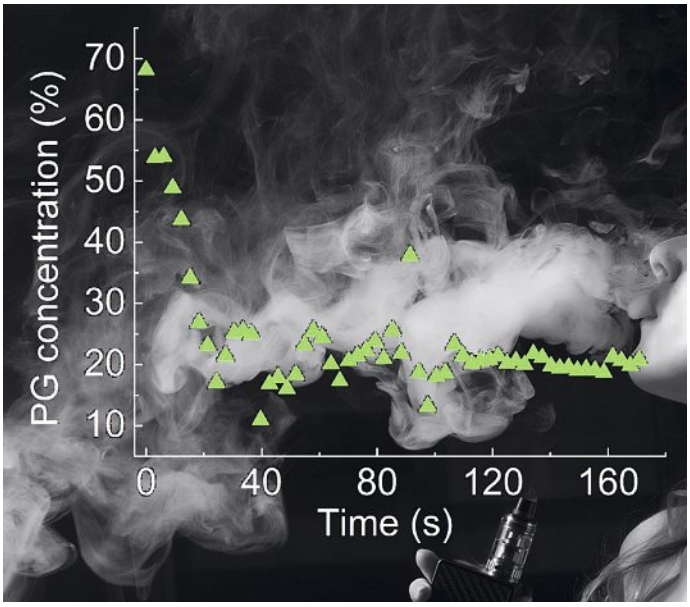
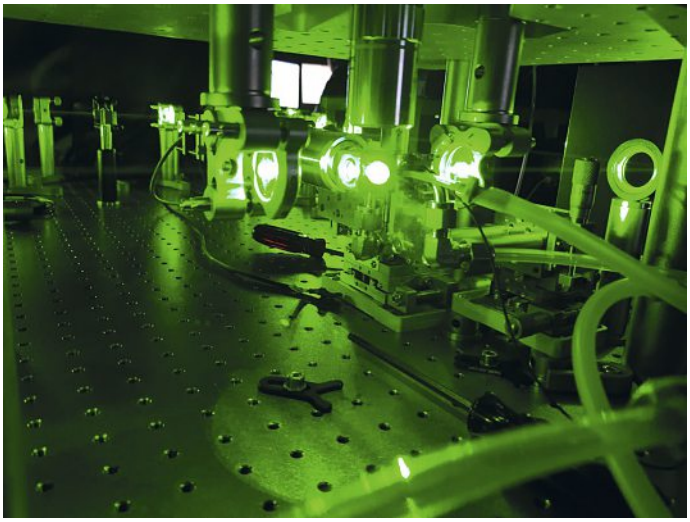


The foreground graph of the figure shows the typical time evolution of the propylene glycol (PG) concentration in e-cigarette droplets isolated in air. Most of the PG in the droplets is evaporating within 20 s and its concentration then stabilizes around 20%. The background shows a person vaping an e-cigarette and the droplets generated from it.



Picture of the optical setup used for trapping single e-cigarette droplets.

Reference
G. David, E. A. Parmentier, I. Taurino, R. Signorell, *Sci. Rep.* **2020**, *10*, 7929.

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