SOCIÉTÉ CHIMIQUE DE GENÈVE

Optical spectroscopy on crystal nucleation: one crystallization at a time

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Crystallization is a ubiquitous phenomenon, yet the mechanism of crystal nucleation and polymorph selection remains as an unsolved mystery. In many industries including pharmaceutical and food industries, controlling polymorphs is crucial in managing the quality control of products. The biggest challenge in studying the early stage of crystallization is the stochastic nature of crystal nucleation. We cannot predict when and where it occurs, which has limited microscopic observation of the phenomenon. In our group, we have been developing *in situ* optical spectroscopy tools to address this problem and establish microscopic understanding of the early stage of crystallization.

This conference will highlight one of the tools we developed in Geneva, so-called Single Crystal Nucleation Spectroscopy (SCNS). SCNS is based on the combination of optical trapping and Raman microspectroscopy, which confines one crystal nucleation event under a Raman probe light. This technique allows us to follow the Raman spectroscopic feature of one crystal nucleation at a time at the tens of *ms* time resolution. Through the spectral analysis, we can identify the formation of prenucleation aggregates as well as polymorph formation pathway of various systems. I will specially show the example of glycine crystallization in water and saltwater. This unique approach provided convincing results in settling a long-lasting debate on the early stage of crystallization of glycine system. The molecular level insights gained by SCNS on crystal nucleation play the key role towards rational design of polymorphism.

Conference presented on:

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University of Geneva – Science III building
Auditoire 1S059
30 quai Ernest-Ansermet Genève

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