LadHyX Seminar – May 30th, 10:45

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Evaporation dynamics of respiratory-like droplets and their implications on virus infectivity

Viruses can remain infective in the aerosolized solid residue left upon the evaporation of respiratory droplets for very long times. However, the precise mechanisms that allow viral particles to endure the harsh physico-chemical conditions found in these drops for so long are poorly understood. In this talk we present our ongoing theoretical and experimental study of the transport of solutes and viral particles inside evaporating complex drops, with the aim at elucidating the precise physico-chemical mechanisms that ultimately lead to viral inactivation. In a first part of the talk we present a model of the evaporation of complex drops, containing water, salt, and a glycoprotein (Mucin). This model has been validated against experiments of evaporating spherical droplets semi-levitated on superhydrophobic substrates, as well as sessile ones. This model is then used to estimate the viral decay rate depending on the drop properties and atmospheric conditions. In a second part of the talk, we develop a more comprehensive model of the transport of salt and protein inside the drop. We use this model to explain the spatial distribution of viral particles in the dry residue of a sessile drop that we have observed experimentally. We conclude with a discussion of the plausible mechanisms of viral inactivation, based on our experiments.