REVEALING NON-EQUILIBRIUM DYNAMICS BY HOLOGRAPHY: THE CASE OF BRIGGS-RAUSCHER REACTION

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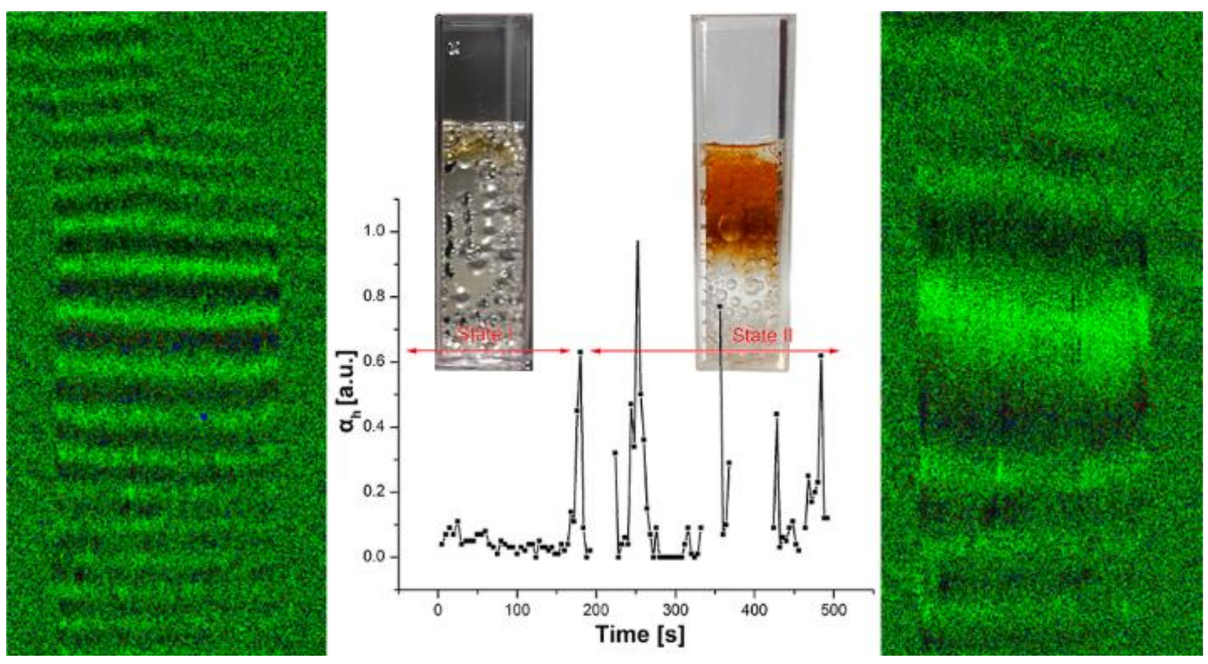
Introduction:

In this study, the interferometric (holographic) approach is used to unveil the dynamics of the phase transition, e.g., the formation of solid iodine in the Briggs-Rauscher (BR) non-equilibrium system. Subsequently, after deterministic oscillatory dynamics this system undergoes random transition from state I (low iodide and iodine concentration) to state II (high iodide and iodine concentration, with the formation of solid iodine).

$$CH_2(COOH)_2 + IO_3^- + 2H_2O_2 + H^+ \xrightarrow{Mn^{2+}catalyst} CHI(COOH)_2 + 2O_2 + 3H_2O$$

Experimental:

The observed interferometric pattern of dark and bright lines known as fringes is applied to monitor the changes in BR dynamics as a function of time. The pattern abruptly changes at the point of the phase transition.



Conclusion:

The power of holography is related to its ability to see the rise of the phase transition directly. At the same time, other methods, such as potentiometry (often used in non-equilibrium studies), are limited by secondary processes such as adsorption and electrode passivation. The holography opens the way to reveal nanoscale dynamics with minimal disturbances in various non-equilibrium systems.

References:

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