北京大学物理化学长葛未名创新工场讲座

Peking University Physical Chemistry Chang-Ge Lecture

Probing CO_2 reduction dynamics with time-resolved Raman spectroscopy

Prof. Ward van der Stam

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In this presentation, I will discuss how we deploy *in situ* time-resolved Raman spectroscopy (TR-SERS) to investigate the electrocatalytic activation of CO_2 and the dynamic chemical structure of the electrode surface.We have combined TR-SERS with cyclic voltammetry, chronoamperometry and pulsed electrolysis to study the time- & potential-dependent behavior of the electrode surface and the adsorbed species. Furthermore, we deployed identical location electron microscopy and TR-SERS to elucidate spatiotemporal effects of copper electrodes at work. Finally, I will show the utilization of TR-SERS and *in situ* X-ray characterization techniques to couple the structure of the electrocatalyst to the performance for well-defined nanoparticle electrodes.

Dr. Ward van der Stam is a tenure track assistant professor at Utrecht University. His research has focused on the development of colloidal synthesis strategies toward well-defined nanoparticles of various compositions, with a strong emphasis on the use of earth-abundant materials, like copper. Furthermore, he acquired expertise regarding self-assembly of nanoparticles, the development of cation exchange and doping reactions, and in-situ X-ray diffraction. He obtained his PhD degree from Utrecht University in 2016 under the supervision of dr. de Mello-Donegá and prof. Meijerink. Thereafter, he did a postdoctoral stay at Delft University of Technology under the supervision of prof. dr. Arjan Houtepen, where he worked with in-situ (spectro)electrochemical methods and ultrafast spectroscopy techniques to elucidate the influence of electrochemical doping on the structural and optical properties of colloidal nanomaterials. Currently, his research at Utrecht University combines the acquired expertise in colloidal nanoparticle synthesis strategies, electrochemistry and in-situ spectroscopy and diffraction techniques to access and understand novel reaction pathways in the electrocatalytic conversion of CO_2 into value-added chemicals and fuels. Furthermore, Ward likes to share his passion for sustainability research and what chemistry can do to mitigate CO_2 emissions with the next generation of scientists through knowledge dissemination events for children.

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