In-situ/operando spectroscopic studies of electrochemical energy reactions

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Abstract: Understanding the reaction mechanism at molecule level and monitoring the structure and its evolution at atomic/microstructural scale are of significant importance in developing electrochemical applications. Traditional electrochemical methods use potential or current as both stimulation and detection signals, and can provide phenomenological results on electrode reaction mechanism and kinetics, and have also advantage in counting accurately electrons transferred in reactions. While the traditional electrochemical methods lack of molecule recognition ability and can not detect electrode structure and its evolution. Therefore, to develop electrochemical in-situ/operando spectroscopic methods is the key to gain knowledge on electrochemical reactions at molecule level and at atomic/microstructural scale.

This communication reports our recent progresses in studies of electrochemical energy processes involved in both energy conversion (Fuel Cells) and storage (Batteries) through developing in-situ/operando spectroscopic methods, including Fourier Transform Infrared Spectroscopy (FTIRs), Nuclear Magnet Resonance (NMR), On-line Electrochemical Mass Spectroscopy (OEMS), Electrochemical Quartz Crystal Microbalance (EQCM), X-Ray Diffraction (XRD), Transmission Electron Microscopy (Operando-TEM), and Synchrotron-based X-Ray Spectrometry (XRS). The results allowed to achieve a deep understanding of electrode structure evolution and reaction mechanism at microstructure and molecule level. In addition, the first infrared free electron laser and spectroscopic facilities for energy chemistry studies building up in China will be briefly introduced.

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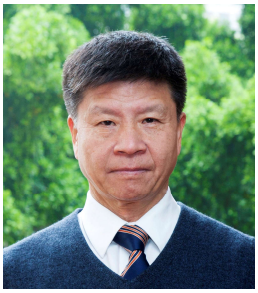
Biography:



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