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**Resonant Soft X-Ray Scattering: A Versatile Technique for Spatio-Chemical Characterization of Solar Fuel Materials** ISVAR CORDOVA, GREGORY SU, DAVID KILCOYNE, CHENG WANG, Lawrence Berkeley Natl Lab — The development of complex mesoscale (nm - m) materials used for a wide range of solar fuel applications requires comparable evolution in the analytical instruments and techniques in order to understand the physical and chemical structure-property relationships underlying their performance. In this presentation, we will show some of the first experimental results demonstrating how Resonant Soft X-Ray Scattering (RSoXS) can be a powerful tool for the solar fuels community due to its chemical sensitivity, large accessible size scale, and polarization control. Specifically, we will reveal its ability to simultaneously interrogate the bulk, surfaces, and buried interfaces of low-Z element materials (including BiVO<sub>4</sub>), such as those used as nanostructured photoelectrodes, catalysts, and ion exchange membranes. In addition, we will outline recent developments we have made, on both the instrumental and device level, to enable operando and in-situ RSoXS characterization of electrochemical materials in liquid and gaseous environments. The practical challenges of conducting such experiments will be addressed so that the solar fuels community is well-informed about the potential of this novel time-resolved reciprocal space probe.

Isva Cordova  
Lawrence Berkeley Natl Lab

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