Unraveling the Impact of Charge Carrier Trapping on Photoelectrode Performance

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Photoelectrochemical water splitting is a promising approach for converting solar energy into chemical energy stored in molecular hydrogen and oxygen. However, the efficiency of this process strongly depends on the properties of the photoelectrode materials. Metal oxide semiconductors are commonly employed as photoelectrodes, but their poor charge transport properties and limited surface catalytic activity can significantly constrain overall performance. In particular, charged defect sites, both in the bulk and on the surface of oxide semiconductors, can trap charge carriers and slow down interfacial kinetics. In this talk, I will present the time-evolution of interfacial charge trapping and transfer processes in $BiVO_4$ photoanodes and $CuBi_2O_4$ photocathodes.

Sarp Kaya received his PhD in Physical Chemistry in 2007 after completing his studies on ultrathin metal oxide layers at Fritz Haber Institute of the Max Plank Society and Humboldt University. During his post-doctoral studies at Stanford University (2007-2010) and following research activities as a scientist at SLAC National Accelerator Laboratory (2010-2014) and Joint Center of Artificial Photosynthesis (JCAP) (2011-2014) he heavily utilized synchrotron radiation for investigations on gas-solid and liquid-solid interfaces. He has joined the Department of Chemistry, Koç University in 2013. He has also been co-director of Koç University Tüpraş Energy Center (KUTEM) since 2019.