

Changes in local electronic structure on the Si/TiO₂/Fe₂O₃ photo-catalysts

Anurag Kawde¹, Manuel Boniolo², Andrea Carlantuono³, Johannes Messinger⁴, Pieter Glatzel⁵

¹Chemistry Department Umea University And ESRF, Grenoble, France, ²Chemistry Department, Umea University, Sweden, Umea, Sweden, ³European Synchrotron Radiation Facility (ESRF), Grenoble, France and Politecnico di Milano, Milano, Italy, Grenoble, France, ⁴Chemistry Department, Umea University and Uppsala University, Sweden, Umea, Sweden, ⁵European Synchrotron Radiation Facility (ESRF), Grenoble, France, Grenoble, France
E-mail: anurag.kawde@esrf.fr

The design of efficient photo-electrodes for conversion of solar energy to renewable fuels like hydrogen and oxygen through overall photo/electrochemical water splitting reaction is presented in this study. We fabricated Si nanowires (Si-NWs) and decorated them with TiO₂ and Fe₂O₃ to study the photo-electrochemical performance and the changes in the local electronic structures of the electrodes. Photo-electrochemical performance of the electrodes was studied with and without bias condition whereas changes in the electronic structure of the as-synthesized electrodes were studied using X-Ray absorption (XANES) and resonant valence-to-core X-Ray emission (vtc-XES) spectroscopic techniques. The latter provides an element and orbital selective band gap. This study presents the changes in the local electronic structure of mesoporous TiO₂ and TiO₂/Fe₂O₃ coated Si NWs. We present XAS and vtc-XES data collected on the bare TiO₂, bare Fe₂O₃ and TiO₂/Fe₂O₃ coated Si NWs at both Ti and Fe K-edge.

- 1) P. Glatzel et al. (2009) Eur.Phys. J. Special Topics 169,207-2014.
- 2) L. Amidani et al. (2015) Angew. Chem. Int. Ed. 54, 5413-5416.
- 3) K. Zakrzewska et al. (2015) Int. J. Hydrogen Energy, 40, 815- 824.

Keywords: [Photo-electrochemical water splitting](#), [X-Ray Spectroscopy](#)