Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Polymer-directed Hybrid Nanostructures for Enhanced Electrocatalytic Activity and Solar Fuel Generation DONG HA KIM, YOON HEE JANG, JI-EUN LEE, LI NA QUAN, YU JIN JANG, EWHA Woman's Univ, POLYMER NANOHYBRID MATERIALS LAB TEAM — In this presentation, we introduce a comprehensive approach to the design and fabrication of hybrid nanostructures directed by functional polymers for photovoltaic, phoelectrochemical and electrocatalytic properties. A unique strategy to generate core-shell nanoparticles based on AuNPs decorated with PANI shell with uniformly distributed alloy metal NPs in the PANI shells was developed. We systematically investigate the structural alteration during the sequential synthetic process and compared the electrocatalytic performance with respect to Pt-decorated AuNP-PANI structures in terms of the oxygen reduction reaction. Aimed for an alternative photoanodes, hierarchical mesoporous carbon-TiO_2 inverse opal nanostructures were synthesized by complementary colloid and block copolymer (BCP) self-assembly, where the triblock copolymer P123 acts simultaneously as template and carbon source. Analytical studies show that incorporation of carbon moieties into TiO_2 creates a new energy level above the valence band of TiO_2, resulting in an effective decrease in the band gap. A significant enhanced visible light photocatalytic activity was demonstrated in terms of the degradation of *p*-nitrophenol ($\sim$ 79 %) and photoelectrochemical water splitting.

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Date submitted: 14 Nov 2014 Electronic form version 1.4