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**Presentation:** Poster Presentation

**Symposium: EN18: Multiscale Designing and Constructing Photocatalytic Materials for Solar Fuels**

**Abstract Title:** Integrated Photocatalytic Materials for Fuel Production

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**Abstract Body:**

Controlling matter and information across the nano-, meso-, and macro-scales is a challenge for science and the imagination. In this presentation, we highlight recent advances in our research efforts to develop synthetic methodologies for constructing an integrated photocathode for light activating chemical transformations that include capturing, converting, and storing solar energy as fuel. A recent example involves development of a direct one-step method to chemically graft porphyrin catalysts that chemically transform water to hydrogen as well as carbon dioxide to carbon monoxide onto a visible-light-absorbing gallium phosphide (GaP) semiconductor. The porphyrin complexes are prepared using a synthetic strategy that yields a tetrapyrrole macrocycle with a pendant 4-vinylphenyl attachment group. This structural modification allows use of the UV-induced immobilization chemistry of olefins to attach intact metalloporphyrin complexes to the semiconductor surface. Solar hydrogen production is demonstrated via photoelectrochemical testing in pH neutral aqueous solutions under simulated solar illumination. Key features of the constructs presented here include use of metalloporphyrins with built-in chemical sites for direct grafting to a GaP semiconductor, creating novel hybrid photoactive assemblies capable of converting photonic energy to fuel.