Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Cobalamin Catalytic Centers for Stable Fuels Generation from Carbon Dioxide WESLEY D. ROBERTSON, BENMAAN I. JAWDAT, NATHAN M. ENNIST, KURT WARNCKE, Emory University, Department of Physics — Our aim is to design and construct protein-based artificial photosynthetic systems that reduce carbon dioxide (CO_2) to stable fuel forms within the robust and adaptable $(\beta\alpha)_8$ TIM-barrel protein structure. The EutB subunit of the adenosylcobalamin-dependent enzyme, ethanolamine ammonia-lyase, from *Salmonella typhimurium*, was selected as the protein template. This system was selected because the Co^I forms of the native cobalamin (Cbl) cofactor, and the related cobinamide (Cbi), possess redox properties that are commensurate with reduction of CO_2. The kinetics of photo- (excited 5'-deazariboflavin electron donor) and chemical [Ti(III)] reduction, and subsequent reaction, of the Cbl and Cbi with CO_2 are measured by time-resolved UV/visible absorption spectroscopy. Products are quantified by NMR spectroscopy. The results address the efficacy of the organocobalt catalytic centers for CO_2 reduction to stable fuels, towards protein device integration.

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Date submitted: 20 Nov 2009 Electronic form version 1.4