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A Bio-Inspired Catalyst for CO_2 Reduction ADONIS BOVELL, KURT WARNCKE, Emory University — Efficient storage of solar energy is critical for the next generation of solar energy conversion systems. Herein is described a catalytic module, using the robust TIM barrel fold of the EutB subunit of ethanolamine-ammonia lyase (EAL), for high specificity recognition and light-driven reduction of CO_2 to energy rich biofuels. EAL catalyzes the deamination of ethanolamine via a free radical mechanism, by using an adenosylcobalamin (AdoCbl) cofactor. Our aim is to use the reducing power of the cobalt(I) form of the cofactor to drive the reduction of CO_2. Molecular biology techniques have been used to generate histidine-tagged EutB subunits of EAL for high throughput protein purification. The binding of cobalamins to EutB was probed by using tryptophan fluorescence quenching. The Hill constant (K_H) and coefficient (n_H) for AdoCbl-EutB binding were determined as 33 μM and 1.3, respectively. The results show that cob(III)alamin binds to isolated EutB, and suggest that Co(II) and Co(I) states will also bind. Rational active site modifications of EutB will be made to facilitate specific CO_2-Co(I) binding and to introduce a proton delivery network. The results will give insight into the challenging task of rational enzyme design.

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