

Novel bioelectrosynthesis of polyhydroxybutyrate (PHB) from CO<sub>2</sub> using *Rhodobacter sphaeroides* in bioelectrochemical system

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To alleviate the greenhouse effect and climate change, it is of great importance to develop sustainable CO<sub>2</sub> capture and utilization. The microbial electrosynthesis (MES) has been highlighted to convert CO<sub>2</sub> to value added metabolites and intermediate chemicals by using electrochemically active bacteria as biocatalyst and electricity as reducing power. However, the MES only produced simple organic acids or alcohols from CO<sub>2</sub>. In this study, we presented a novel bioelectrosynthetic pathway for polyhydroxybutyrate (PHB) production using a photosynthetic bacteria, *Rhodobacter sphaeroides*. The electrode attached *R. sphaeroides* directly uptakes electrons from the electrode surface, while the suspended *Rhodobacter sphaeroides* utilize the electrochemically evolved hydrogen as electron mediator to convert CO<sub>2</sub> to polyhydroxybutyrate (PHB). The results show that MES-driven electrons and protons transfer enabled direct conversion of CO<sub>2</sub> into higher-value added organic matter such as PHB.