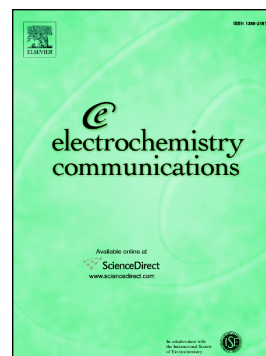


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Electrochemical characterization of bed electrodes using voltammetry of single granules

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Abstract

In the search for high surface area electrodes and higher volumetric performances for bioelectrochemical systems, the use of bed electrodes has become a vital field of research. In bed electrodes, conductive particles, i.e. granules, are used as bulk material and are polarized for biofilm growth. One intrinsic constraint of bed electrodes is that these cannot be analyzed by dynamic electrochemical techniques like cyclic voltammetry (CV) due to their high internal resistance and poor polarization behavior. Therefore, solutions to elucidate the extracellular electron transfer (EET) fundamentals in bed electrodes are needed. In this study we show, using the example of a *Geobacter*-based bed electrode, that the thermodynamics of the EET of single granules can be revealed. This is achieved by cyclic voltammetry of single granules. A novel 3D-printed clamp working electrode is presented which can be exploited further for electrochemical analysis of biotic and abiotic electrode particles.

Keywords: microbial extracellular electron transfer, electrochemical analysis, cyclic voltammetry, 3D-printing, microbial fuel cell

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