

COMPOSITE ELECTRODES FOR ADVANCED ELECTROCHEMICAL APPLICATIONS

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ABSTRACT

The electrochemical industry is one of the most highly energy intensive industries today. However, there have been no significant advances in the electrodes that these industries use. The dimensionally stable anode (DSA), which ELTECH introduced under a license agreement, has been the industry standard for the past twenty-five years. But, DSAs are nearing the end of their technological prevalence. The principal problems with DSAs include high capital and operating costs, and the proprietary nature of the technology. In addition, DSAs experience problems that include: contamination of the process solution by anode materials, failure when the electrocatalytic coating peels from underattack, generally low anode performance due to inherent limitations in operating current density, and short anode lifetime because of corrosion.

The proposed innovation combines the low electrical resistance of copper with the corrosion resistance of electrically conductive diamond to achieve energy efficient, long-lifetime electrodes for electrochemistry. The proposed work will ultimately develop a composite electrode that consists of a copper substrate, a conductive diamond coating, and a catalytic precious metal coating. The scope of the current work includes preparation, testing, and evaluation of diamond-coated titanium electrodes.

PROGRESS

During the fifth quarter of this work, North Coast Crystals (NCC) evaluated the experimental results of both Eltech Research Corporation (ERC) and Chemionic Enterprises (CIE). The fourth quarterly report lists these results. NCC and ERC are also determining, based on the experimental results, the direction of the last set of experiments. NCC has also forwarded a set of diamond-coated substrates to CIE for evaluation. However, CIE will be unable to evaluate these electrodes until the sixth quarter. There has been no other work during the fifth quarter of this project.

Future Work

During the 13th, 14th, and 15th months of this work, NCC, ERC, and CIE will complete fabricating and testing these electrodes. NCC may also propose additional work to replace a subtask in the original proposal.

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