Short Communication

Effects of $\text{Ti}_3\text{C}_2\text{T}_x$ nano-sheets (MXenes) on the microstructural and electrochemical properties of SnO_2/Ti anodes

Sergio González-Poggini¹, Andreas Rosenkranz¹, Bo Wang², Samuel Hevia³, Jinhong Yu²,
Melanie Colet-Lagrille^{1,*}

¹ Department of Chemical Engineering, Biotechnology and Materials, Faculty of Physical and Mathematical Sciences, Universidad de Chile, Beauchef 851, Santiago, Chile

² Key Laboratory of Marine New Materials and Related Technology, Zhejiang Key Laboratory of Marine Materials and Protection Technology, Ningbo Institute of Material Technology & Engineering, Chinese Academy of Sciences, Ningbo 315201, People's Republic of China

³ Instituto de Física y Centro de Investigación en Nanotecnología y Materiales Avanzados, Pontificia Universidad Católica de Chile, Macul, Santiago, Chile

*E-mail: mcolet@ing.uchile.cl

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The effects of the incorporation of $\text{Ti}_3\text{C}_2\text{T}_x$ nano-sheets (MXenes) on the microstructure of SnO_2/Ti electrodes and their electro-oxidation catalytic activity for the degradation of methyl red is studied in this work. MXenes- SnO_2/Ti electrodes are fabricated by spin-coating followed by a thermal treatment under ambient atmospheric conditions using a solution containing MXene nano-sheets, SnCl_2 , citric acid and ethylene glycol as precursor. Energy-dispersive X-ray spectroscopy, Raman spectroscopy and X-ray diffraction analyses of the MXenes- SnO_2/Ti electrodes surface indicate the formation of $\text{SnO}_2\text{-TiO}_2$ films with Ti^{4+} ions incorporated into the lattice of SnO_2 crystals. Cyclic voltammetry curves demonstrate that the oxygen evolution reaction is restrained by the MXenes- SnO_2/Ti electrodes, while the methyl red electro-oxidation is enhanced – with kinetics following a pseudo-first-order model – compared to the performance of (pure) SnO_2/Ti electrodes. These results suggest that oxygen vacancies are formed in the crystal lattice of MXenes- SnO_2/Ti electrodes, which act as charge carriers and increase the electrical conductivity of SnO_2 as confirmed by the lower charge transfer resistance of MXenes- SnO_2/Ti electrodes determined by electrochemical impedance spectroscopy analysis.

Keywords: 2d materials; $\text{Ti}_3\text{C}_2\text{T}_x$ nano-sheets; anodic oxidation; SnO_2 -based electrodes; water treatment

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