31º ENCONTRO DE QUÍMICA DA REGIÃO SUL
A QUÍMICA COMO PROPULSORA DE NOVOS ECOSSISTEMAS DE INOVAÇÃO
19 A 21 DE NOVEMBRO
Campus Toledo
Unioeste

Área: FIS

Functional thin-film heterojunctions applied to hydrogen production via photoelectrocatalysis.

Maurício Rocha e Silva Carias de Oliveira (PG)[1]*, Marcelo Zampieri (PQ) [1], Roberta Antigo Medeiros (PQ)[1], Alexandre Urbano (PQ)[2], Roberto de Matos (PQ)[1]

rmatos@uel.br; mcarias@uel.br;

[1]Departamento de Química, UEL; [2]Departamento de Física, UEL

Palavras-Chave: *Water splitting, Hydrogen, heterojunctions, S-scheme, Semiconductors.*

Highlights

A ternary CuO/WO_3/$BiVO_4$ photoanode forming an S-scheme/Type II heterojunction was developed for water-splitting applications, exhibiting a significantly higher photocurrent density compared to the individual oxides.

Resumo/Abstract

In this work, we investigated a ternary heterojunction composed of CuO, WO_3, and $BiVO_4$. These oxides are well known for their photocatalytic applications due to their low cost and low toxicity. However, their individual use faces several limitations, such as electron–hole recombination, photocorrosion, and low charge carrier mobility. To mitigate these drawbacks, heterojunctions can be constructed. In this study, thin films were deposited electrochemically and by drop casting. The resulting ternary photoelectrodes were heat-treated at 485 °C for 1 h and 5 h to evaluate the influence of thermal treatment duration on their photoelectrochemical performance. The photo(electro)chemical properties were evaluated by chronoamperometry (CA) and UV–Vis spectroscopy. The ternary CuO/WO_3/$BiVO_4$ photoanodes treated for 1 h and 5 h exhibited photocurrent densities of approximately 0.5 mA cm^{-2} at 1.23 V vs. the Reversible Hydrogen Electrode (RHE), (Fig1(A)). The photoanodes were identified as forming an S-scheme/Type II heterojunction (Fig1(B)), demonstrating effective performance toward water-splitting applications.

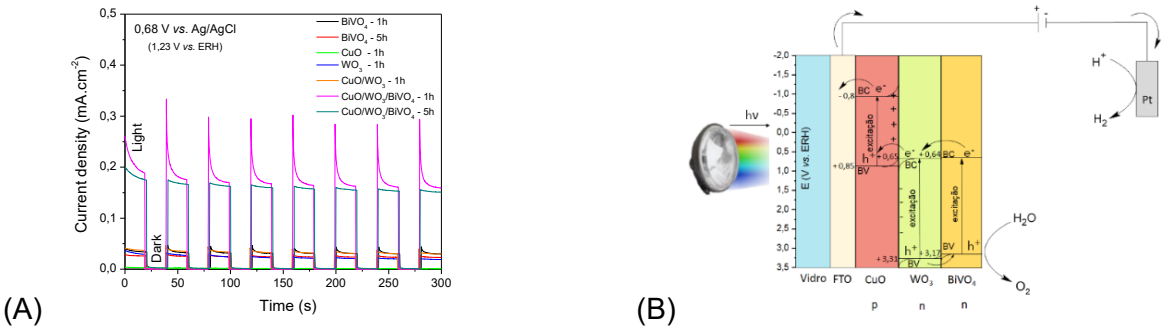

Figure 1. (A) Photocurrent densities of the materials and (B) schematic illustration of the CuO/WO_3/$BiVO_4$ heterojunction.

Agradecimentos/Acknowledgments

LaEEM Laboratório de Eletroquímica, Eletroanalítica e Materiais
Lab. Filmat
LADEMA Laboratório de Desenvolvimento de Métodos Analíticos
LEMA Laboratório de Eletroquímica e Materiais
LAR UEL
LMEM
CAPES
CNPq Conselho Nacional de Desenvolvimento Científico e Tecnológico
ARAUCÁRIA