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Advanced Materials Science Research

Microwave-Assisted Synthesis of Metal Semiconductors Heterojunctions with Photocatalytic Applications

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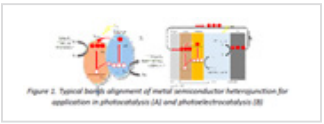
Biography

Bachelor in Chemistry at Universidade Estadual Paulista - UNESP/ Araraquara – SP, in 2008, with an exchange period at University of Florida – EUA. Master and PhD in Science and Technology - Chemistry at Federal University from ABC – SP – in 2011 and 2016, respectively.

Exchange PhD at University of Southampton – UK – in 2014. Post- Doctorade in Fundamental Chemistry at University of São Paulo – SP – in 2017. Currently she is Adjunct Professor – level A at Federal University from ABC. Her main research area is in Inorganic Chemistry, studying the synthesis of semiconductors metal oxides through microwaveassisted methodologies, preparation of multihierarchical systems, heterogeneous catalysis, photocatalysis and photoelectrocatalysis and development of devices for energy conversion.



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Using solar light in photo-induced processes is very attractive since it is a clean and practically limitless energy source. Recently research related to the development of new photocatalysts capable of use this kind of energy has been growing. Metal semiconductors have excelled in this field, however, the development of materials capable of utilize the visible component of the radiation (major portion of the Sun fallout) it is a contemporary challenge. My research group is focused on the development of new heterojunctions of nanostructured metal semiconductors, whose synergic effect make it possible the use of the visible radiation, resulting in improved photocatalytic activity.

The talk will be focused on the following heterojunctions: titanate nanotubes/carbon nitride, bismuth vanadate/gold nanoparticles, bismuth vanadate/tungsten oxide, bismuth niobate/gold and silver nanoparticles, and bismuth niobate/tungsten oxide.

These catalysts were synthesized through microwaveassisted routes, an emergent technique that allows quickly obtaining of the desired products, with high selectivity, high yields and low energetic consumption, in comparison to conventional synthesis methods. Thus, several methodological studies can be carried out in a short period of time, allowing the investigation of the ideal synthetic conditions to obtain nanomaterials with controlled morphology and structure. As a result, accurately establishment of new protocols of microwaveassisted synthesis, were achieved.

These heterojunctions were characterized through several techniques and applied on photodegradation of organic species and photoelectrochemical generation of H2. For these applications a correct band alignment between the heterojunction components is required.Typically, the photogenerated electrons must flow from the external semiconductor to the host semiconductor; the photogenerated holes must flow from the host to the external semiconductor. This charge separation increases the electrons lifetime by reducing the recombination rates.

Figure 1a show the band alignment of a heterojunction applied for photocatalysis and Figure 1b show a typical photoelectrochemical cell using these heterojunctions.

Publications

- Microwave-Assisted Synthesis of Bismuth Niobate/Tungsten Oxide Photoanodes for Water Splitting
- Influence of Preparation Methodology on the Photocatalytic Activity of Nitrogen-Doped Titanate and TiO2 Nanotubes
- Facile one-pot microwave-assisted synthesis of tungsten-doped BiVO4/WO3 heterojunctions with enhanced photocatalytic activity
- Controlling Bismuth Vanadate Morphology and Crystalline Structure through Optimization of Microwave-Assisted Synthesis Conditions
- Cover Feature: Tailoring a Zinc Oxide Nanorod Surface by Adding an Earth-Abundant Cocatalyst for Induced Sunlight Water Oxidation (ChemPhysChem 6/2020)

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