Ni and Ru Loading on $Sr_2Ta_2O_7$ by Electroless to Enhance its Photocatalytic Hydrogen Evolution from water

C.L Compean-González[1], V. M. Arredondo-Torres[2], M.E Zarazúa-Morin[1], M.Z Figueroa-Torres[1*]

[1]Departamento de Ecomateriales y Energía, Facultad de Ingeniería Civil, Universidad Autónoma de Nuevo León, Av. Universidad s/n Ciudad Universitaria San Nicolás de los Garza Nuevo León, México. CP. 66451.
[2]Facultad de Químico Farmacobiología, Universidad Michoacana de San Nicolás de Hidalgo, Tzintzuntzan #173, Col. Matamoros, Morelia, Michoacán, México. C.P. 58240
*Tel: +5214424421; e-mail: m_zyzlila@yahoo.com.mx

ABSTRACT

Hydrogen has been recognized as an important energy carrier, especially for use it in fuel cell. Clean and sustainable hydrogen production is still a challenge for scientists to solve energy and environmental problems. Therefore, water splitting using a photocatalyst is one of the most attractive alternatives for hydrogen production. However, most semiconductors cannot give high H_2 evolution activities without a cocatalyst even in the presence of sacrificial electron donor. This work evaluates the effect of textural characteristics of the strontium tantalate on its surface modification with nickel and ruthenium nanoparticles by electroless deposition. The material with smooth texture was synthesized by solid state reaction and porous texture by combustion synthesis. Nitrogen adsorption isotherms indicate that the material present a mesoporous structure. The energy band gab values calculated from Kubelka-Munk formula were 4.6 and 3.8 eV for smooth and porous materials respectively. Specific surface areas were estimated by the BET equation. The porous material exhibited a surface area 2.1 times greater than the smooth material. Ni and Ru nanoparticles deposited onto $Sr_2Ta_2O_7$ are highly dispersed, they present spherical shape and a narrow size range between 3-8 nm. It was found that hydrogen evolution under UV irradiation was significantly increased when a suitable amount of nanoparticles is dispersed, which dependent of the texture properties.

Keywords: texture; photocatalysts