7-11 JULY 2024
NANOSMAT Barcelona
15th International Conference on Surfaces, Coatings and Nanostructured Materials
www.nanosmat2024.com

ABSTRACT:

Evaluation of Hydrogen Production by Black Diamond-Based Photoelectrochemical Converters through the SPEEDHY Project Concept

R. Turco1, R. Vitiello1, R. Tesser1, A. Bellucci2
1Department of Chemical Sciences, University of Naples Federico II,
via Cintia, 80126 Naples, Italy.
2Institute of Structure of Matter of National Research Council, CNR-ISM,
Montelibretti, 00010 Rome, Italy.

Solar-driven PEC has attracted a relevant interest by the scientific community with the aim at reducing the devices' fabrication costs and improve efficient processes. Even if some outstanding in terms of conversion efficiency reported for PEC based on semiconductors solar cells, there some important limitations that prevents their full exploitation, such as the thermal and physical stability. To overcome the limitations of the mentioned converters, we propose the use of a new material, black diamond, which can act at the same time as solar converter at high temperatures and photocatalytic electrode, as well. The technology proposed by "SPEEDHY", a recent project financed by Italian Minister of Research (MUR), is based on simple photo-catalytic device, thanks to the combination of an ultra-wide energy bandgap, capability of efficiently absorbing and converting solar photons, enhances surface activities and stable operations at medium-high temperature [1]. The proposed device is a black diamond photoelectrochemical (PEC) converter. Black diamond is a wide bandgap semiconductor, able to absorb and convert solar radiation, overcoming the limitation of diamond, that is used in electrocatalysis but suffers into absorption the solar radiations. SPEEDHY technology exploits the advantages of PEC and solar thermochemical converters, minimizing the main power losses. SPEEDHY is to provide effective routes for the green production of the most important chemical fuels using a unique technological platform, which can be properly and easily tuned to the specific need.

[1] M. Mastellone et all. Nano Letters, 21, 4477 (2021)