The Serbian Society for Ceramic Materials
Institute for Multidisciplinary Research (IMSI), University of Belgrade
Institute of Physics, University of Belgrade
Center of Excellence for the Synthesis, Processing and Characterization of Materials for use in Extreme Conditions "CEXTREME LAB" - Institute of Nuclear Sciences "Vinča", University of Belgrade
Faculty of Mechanical Engineering, University of Belgrade
Center for Green Technologies, Institute for Multidisciplinary Research, University of Belgrade
Faculty of Technology and Metallurgy, University of Belgrade
Faculty of Technology, University of Novi Sad

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ADAPTATION OF N-TiO_2 PROPERTIES USING TARGETED DEPOSITION OF TRANSITION METALS

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The ongoing effort to boost the renewable energy in everyday life makes hydrogen as a fuel an increasingly attractive concept. However, before fully integrating the hydrogen economy into energy revolution, hydropower systems still need an upgrade in energy efficiency, safety, and cost reduction. Among other ways, hydrogen is produced via electrolytic water splitting, using an external energy source, such as solar power, to generate the electricity to split water into hydrogen and oxygen. This is environmentally friendly and efficient, but still too expensive for a large-scale sustainable hydrogen production. If the water splitting is carried out using already available solar power, the electrolytic cell can be omitted from the system, thus reducing the number of steps in the manufacturing process. This concept can be economically acceptable if high solar-to-hydrogen efficiency is achieved. With this in focus, a number of research studies address the potential of various materials as future hydrogen generators.

The presented research combines theoretical and experimental scientific methods to address the potential for integration of two separate renewable energy technologies into one sustainable technology. Solar energy based hydrogen production presents a viable milestone in the renewables economy, yet due to lack of understanding of basic processes that can increase its utilization, it is still an incomplete concept. Phenomena of hydrogen dynamics on the surface of the photocatalytic semiconductor are determined by its inherent electronic structure, while the quantum nature of electrons lies within the field of fundamental research. The theoretical modelling and simulation of photochemical processes correlated with hydrogen behaviour on the electronic level predict possible interactions on interfaces of photochemical cells, while the experimental analysis further verifies these predictions. The collaborative scientific effort provides an extensive overview of the novel information, which can be used to guide and accelerate technological progress.