

**Proceedings of Annual Istanbul International Multidisciplinary Conference  
on Economics, Business, Technology and Social Sciences -2023**

Dates: 13-14 May, 2023

Venue: “Elite World Istanbul Hotel”, Istanbul, Turkey (In-person and Online)

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## **Green Hydrogen Renewable Energy Based Society for Sustainable Economic Development-Challenges and Perspectives**

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### **Abstract**

The contemporary industry is mainly based on fossil fuels to be exhausted in near future. It causes environment pollution and greenhouse effect. During the last century the CO<sub>2</sub> concentration increased 20%, raising average temperature on Earth. It means undesirable climate changes, biodiversity disorder and natural disasters. The development of alternative power sources is needed.

United Nations had recognized problem and global actions have already taken. European Union established main targets until 2030- Climate and Energy Package. The Paris Agreement (2015) adopted by 196 Parties from all over the world facilitated low-carbon solutions. Zero-carbon solutions are increasing in economy, especially the power and transport sectors.

“The global climate fight will be won or lost in this crucial decade – on our watch. So let’s fight together– and let’s win” (A. Guterres, UN General Secretary-November 2022).

Thus, development of hydrogen production and fuel cells as zero-emission technologies is needed, to achieve sustainability and circular economy. Hydrogen is high efficiency and environmental friendly fuel. It is produced by water electrolysis, industrial procedure processed in alkaline solution, at 80°C. The main disadvantage is still high energy consumption (~ 5kWh m<sup>-3</sup> H<sub>2</sub>). The hydrogen fuel is used in fuel cells, while oxidative agent is oxygen from air. Many researchers' efforts were done to make progress in this area during past decades. State-of-the-art catalysts are noble metals (carbon supported Platinum) – still expensive for large-scale commercial use. In this research novel solutions for fuel cells catalysts based on low loading precious metals were investigated. Higher efficiency and durability were achieved if compared to commercial Pt/C. Comparative study on Platinum and Palladium based catalysts was presented. Challenges and perspectives were discussed in terms of technological, social and financial issues. Trading and prices of noble metals were discussed, as well.

**Keywords:** Renewable energy; Sustainable economic development; Hydrogen production; Fuel cells; Zero-emission.