SYNTHESIS OF N-DOPED CARBON SUPPORTED Au-Cu NANOPARTICLES USING MICROWAVE HEATING METHOD

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One of the most commonly used renewable energy sources is fuel cells that directly convert the chemical reaction energy into electricity. In this work, the N-doped carbon materials derived from biological waste, such as alder wood chips and black liquor, were used as a substrate for deposition of gold-copper nanoparticles (Au-CuNPs) using the microwave heating method. The wood-based carbon powders were doped with nitrogen at a temperature of 800 ° C using dicyandiamide (DCDA) as a nitrogen precursor. For synthesis of catalysts, a reaction mixture of the same composition consisting of 1.3 mM $HAuCl_4$, 0.06 M $CuCl_2$, 0.05 M NaOH, ethylene glycol, and different N-doped carbon materials was put into a microwave reactor Monowave 300 (Anton Paar). Synthesis of Au-CuNPs and N-doped carbon composites was carried out at a temperature of 150°C for 30 min. After preparation, the synthesized catalysts were washed with acetone, then filtered and dried in an oven at a temperature of 80°C for 2 h.

The surface morphology and structure of the synthesized Au-CuNPs/N-doped carbon composites were investigated using transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), scanning electron microscopy (SEM), and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES).

It was found that the size of Au-CuNPS were in the range of 5-50 nm in the prepared composites. Moreover, the Au loadings were in range from 71 to 90 $\mu g_{Au}\ cm^{-2}$ and particles size were in the range 5-50 nm. The highest nitrogen content was found to be 7.44 at. % in the N-doped carbon powder obtained from cellulose waste.