# BIOLOGICAL AND CATALYTIC ACTIVE NANOCOMPOSITES OF METAL NANOPARTICLES (Ag, Au, AND Cu) AND CONDUCTIVE POLYMERS (POLYANILINE AND POLYPYRROLE) FOR VARIOUS APPLICATIONS

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## Abstract

A special group of functional materials with advanced features and accordingly promising applications are the nanocomposites of the metal nanoparticles (MNPs) - gold (Au), silver (Ag), and copper (Cu) and intrinsically conductive polymers - polyaniline and polypyrrole [1-7]. Thanks to the characteristics of these MNPs such as tunability of the plasmon resonance through variation of their size, shape, and composition, in combination with polymers, it is possible to create nanocomposites for specific biomedical and catalytic use as a variety of biological/catalytic processes occurring at nanometer scale. These processes are also related to the surface effects of the MNPs, i.e. the reactive (111) crystallographic planes present on their surface, together with the electrical characteristics and morphology of the polymer, as well as the synergistic activity of both components. Biocompatible polymers with good conductivity and electrochemical activity, such as polyaniline or polypyrrole, are good choices for the formation of functional composites with these MNPs, by *in-situ* polymerization processes. In addition, they protect the MNPs from agglomeration or oxidation and improve their physicochemical characteristics, functions, and variety of applications. The electrocatalytic response of the different prepared nanocomposites for oxygen reduction reaction, and direct borohydride fuel cells, together with their antimicrobial activity, currently investigated in this field in our group, are the subject of the presented work.

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