Comparative study of the electrochemical, biomedical, and thermal properties of natural and synthetics nanomaterials

ABSTRACT

In this research, natural nanomaterials including cellulose nanocrystal (CNC), nanofiber cellulose (NFC), and synthetic nanoparticles such as carbon nanofiber (CNF) and carbon nanotube (CNT) with different structures, sizes, and surface areas were produced and analyzed. The most significant contribution of this study is to evaluate and compare these nanomaterials based on the effects of their structures and morphologies on their electrochemical, biomedical, and thermal properties. Based on the obtained results, the natural nanomaterials with low dimension and surface area have zero cytotoxicity effects on the living cells at 12.5 and 3.125 µg/ml concentrations of NFC and CNC, respectively. Meanwhile, synthetic nanomaterials with the high surface area around 15.3–21.1 m2 /g and significant thermal stability (480 °C–600 °C) enhance the output of electrode by creating a higher surface area and decreasing the current flow resistance.

Keyword: Natural and synthetic nanomaterials; Electrochemical properties; Cytotoxicity effect; Thermal stability