

Synthesis of carbon-coated metal, carbide and sulphide nano-materials by pulsed plasma in liquid method

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Abstract

Synthesis of carbon-coated metal, carbide and sulfide nanomaterials is challenging area in materials science and engineering. Magnetism, biocompatibility and high temperature stability of carbon-coated metal, carbide and sulfide nano-materials enable to use them in different applications. In our work, we present synthesis of onion-like carbon-coated metal (Co-C, Ni-C, and Fe-C), carbide ($WC_{1-x}@C$ and $TiC@C$) and sulfide (CuS) nanomaterials by using pulsed plasma in liquid method (PPL). Pulsed plasma in liquid is simple and inexpensive technique for nano-materials synthesis. Syntheses of onion-like carbon-coated metal (Co-C, Ni-C, and Fe-C), carbide ($WC_{1-x}@C$ and $TiC@C$) and sulfide (CuS) nanomaterials were carried out by using low electrical energy, no vacuum and pressure, without any additives. Properties of these nanomaterials were studied by means of X-ray diffraction (XRD), transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM) and field emission scanning electron microscopy (FE-SEM). For detecting the biocompatibility of as-synthesized onion-like carbon-coated metal (Co-C, Ni-C, and Fe-C) and sulfide (CuS) nanomaterials, we have performed *in vitro* cytotoxicity analyses, using the A549 cell line (Human lung adenocarcinoma epithelial cells) and MCF-7 (breast cancer) cells. Carbon-coated magnetic nanoparticles of Co, Ni, and Fe synthesized by PPL method showed low cytotoxic effects on the cancer cells. As a part of investigation, different cancer cell lines and two types of assays (MTT and XTT) were used for cytotoxicity measurements. Results obtained in this study are making possible to apply onion-like carbon-encapsulated Co, Ni, and Fe magnetic nanoparticles *in vivo* cancer treatment applications.

Biography

Zhypargul Abdullaeva has completed PhD from Kumamoto University. She is the Assistant Professor in Department of Materials Science and Engineering of Kumamoto University. She has published several papers on synthesis of nanomaterials by pulsed plasma in liquid method. Her current interest is aimed to synthesize graphene sheets and their functionalization for biomedical applications.

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