Hydrothermal Synthesis of Copper Sulphide Nanoparticles, Analysis of Their Physical-Chemical Properties and Cytotoxicity in vitro

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Nanotechnology is a rapidly growing, new branch of science. Nanomaterials reveal that a vast majority of research is concentrated on synthesis, development and analysis of gold and silver nanoparticles. The synthesis of these materials is often pricey and requires gallons of toxic solvents. In my research I focused on ecological, economical and easily prepared copper sulphide nanoparticles and the analysis of their properties in relation to a possible usage in medicine. Copper sulphide nanoparticles were synthesized using the hydrothermal method. The reagents were placed in an autoclave reactor. The whole system was sealed and put into a laboratory oven. After cooling, the UV-Vis and DLS spectrum were taken to identify nanoparticles and their particle size distribution. Using TEM, the photos of single nanoparticles as well as their agglomerates were taken. The concentration of nanoparticles was measured using the UV-Vis spectroscopy. Nanoparticles were sterilized and their cytotoxicity in vitro was measured in MG-63 cell line cultures. The obtained nanoparticles UV-spectra were corresponding to the literature data. The TEM and DLS analysis provided information about the size and homogeneity of nanoparticles: 120nm with bigger 400-600nm agglomerates. The chemical composition of nanoparticles was confirmed through the EDS analysis. The statistical analysis of the numbers of cells in the experiments showed no remarkable differences between each group. The hydrothermal synthesis is a cheap, ecological method to synthesize copper sulphide nanoparticles, but the cytotoxicity experiment requires more study. The nanoparticles' concentration measurement protocol developed during the research could be used to quickly measure any copper-based nanoparticles concentration.

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