# Synthesis and modification of Gadolinium ferrite nanoparticles for potential application in neutron capture therapy

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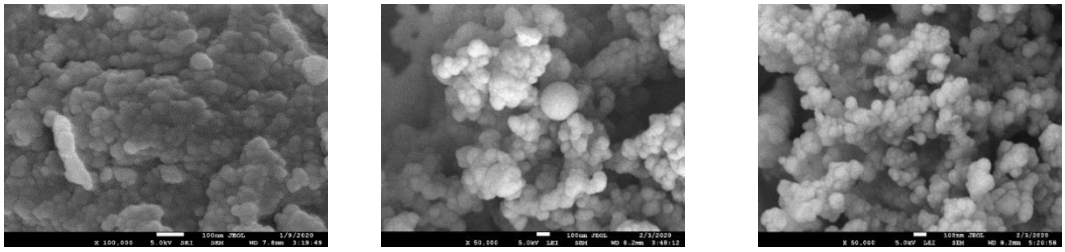
For decreasing the mortality from cancer diseases it is crucial to develop effective and low-invasive treatment methods. One of them is appeared to be neutron-capture therapy (NCT). It is based on a neutron capture reaction of isotopes delivered to tumor and thermal neutron flux. In this kind of reaction with 10B or 157Gd (or their combination) resulting particles have high index of linear energy transfer and low path length. That means effective ablation of cells in a short range. But still for NCT to become beneficial two technical problems should be solved: constructing of compact sources of pointed neutron flux and ability to directly deliver NCT agents in appropriate amount [1]. Delivering via magnetic nanocarriers (MNC) is considered to be promising. MNC are injected in-vivo and guided to tumor by external high-gradient magnetic field [2]. For this purpose, modified $Gd_xFe_{3-x}O_4$ particles were chosen to be MNC. $Gd_xFe_{3-x}O_4$ nanoparticles were synthesized with a chemical co-precipitation method. Average size of gained particles is 33±9 nm. For excluding the toxicity of Gd, particles were covered by tetraethoxysilane (TEOS). Size of TEOS-covered particle – 83 nm. Then it was functionalized with 3-(trimethoxysilyl) propyl methacrylate (MSPMA) to create double bond for further use in graft polymerization of glycidyl methacrylate that led to branched structure allowing attaching carborane cores with higher concentration. Final size is 95 nm. Gained NPs were characterized by SEM, EDX and FTIR spectroscopy. EDX spectroscopy confirmed the presence of covers. Figure 1 presents SEM scans.



A B C

Figure 1. SEM images of A) $Gd_xFe_{3-x}O_4$ B) $Gd_xFe_{3-x}O_4$–TEOS C) $Gd_xFe_{3-x}O_4$–TEOS-MSPMA

**References**

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