

In the submitted bachelor thesis we studied iron oxides by zero-field and in-field Mössbauer spectroscopy at room and liquid helium temperature. The relative composition in synthetically prepared nanoparticles of ferric oxide in SiO_2 matrix is investigated in dependence on ferric oxide concentration and heating temperature and further the phase composition and structure of biological nanoparticles produced by *Geoalkalibacter ferrihydriticus* bacteria in dependence on concentration of quinone in the cultivating solution. By data analysis the chemical and phase composition of the samples and hyperfine parameters of ^{57}Fe cations in nonequivalent crystallographic positions are determined.