**AGH University of Science and Technology**
Faculty of Geology, Geophysics and Environmental Protection
Department of Mineralogy, Petrography and Geochemistry

**Abstract of PhD dissertation**

# „Layered minerals doped with iron nanoparticles showing reductive and magnetic properties for the removal and separation of selected inorganic ions”

**mgr inż. Paulina Maziarz**

**Dissertation supervisor:**
dr hab. inż. Jakub Matusik
Department of Mineralogy, Petrography and Geochemistry
Faculty of Geology, Geophysics and Environmental Protection
AGH University of Science and Technology

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The issue regarding iron nanoparticles arouses great interest due to their perspective use as adsorbents. In the research, as a host of iron oxides (FeOx) and zero-valent iron (Fe0), natural halloysite (aluminosilicate) and synthetic hydrotalcite (double layered hydroxide - LDH) were used. For the synthesis of FeOx and Fe0, the chemical precipitation method and reduction of iron using a strong reducing agent ($NaBH_4$) was used, respectively. As a result of the above procedures, composites with different mass ratio of iron nanoparticles to host phase were obtained. This allowed to take a closer look to the influence of mass ratio on the adsorption and magnetic properties of the obtained nanocomposites. The composites were thoroughly characterized using advanced analytical methods: X-ray diffraction (XRD), infrared spectroscopy (FTIR), scanning and scanning-transmission electron microscopy (SEM, STEM), and X-ray fluorescence (XRF). The great part of the research was devoted to adsorption experiments, like the effect of initial sorbate concentration, pH and ionic strength Additionally, the research allowed to examine the chemical stability and possibility of their regeneration and reuse. In addition, Mössbauer spectroscopy and X-ray photoelectron spectroscopy (XPS) analysis allowed to determine possible adsorption mechanisms.

## Graphical abstract