Carbon nanomaterials have a lot interesting application nowadays, e.g. in catalysis, environment protection, medicine or energy storage. The properties of these materials can be tuned e.g. by doping them with metal compounds.

In the project spherical microporous carbon materials with interesting properties will be produced and tested. Their properties will be coupled with properties of magnetic metal compounds (Fe, Co, Cr, Zn) in form of oxides, carbides, spinels and pure metals or their alloys. In this way, the obtained composites will have both magnetic properties and high specific surface area. Such composites are new and there are only few literature reports about them.

The aim of the project is to produce and characterise composites based on metal compounds (Fe, Co, Zn, Cr) supported on microporous spherical carbon materials obtained through carbonisation of phenolic resins. The composites will be obtained through wet impregnation of carbon spheres with metal compounds or in "one pot" synthesis in the solvothermal reactor. Next, the metal compounds in the composites will be reduced with hydrogen under soft conditions (to reduce metal compounds without destroying the carbon structures) to obtain metal and alloys nanoparticles supported on microporous carbon spheres. All the composites will be carefully characterised to determine their chemical and phase composition, as well their morphology. The next step of characterisation will deal with investigation of adsorption and magnetic properties of the composites. Adsorption of carbon dioxide in the gas phase and adsorption of dyes in solution were chosen as model systems to assess the sorption ability of produced materials. The magnetic properties of the composites will facilitate a separation of sorbent in the liquid phase.

The most important result of the project will be a **determination of correlation** between synthesis conditions and structure of the produced composites, and their magnetic and adsorption properties. The results of the project will deepen the knowledge on metal/carbon composites and will facilitate their designing for various applications. The particular **innovativeness** of the project is related to three elements: application of microwave assisted **solvothermal reactor** for the production of carbon spheres (an innovation comparing to the use of an autoclave, shortening the process time), reduction of metal compounds in the composites under hydrogen to obtain metal/carbon composites and synthesis of composites based on **chromium** compounds supported on carbon spheres which have been never reported in the literature.