

Nanostructured materials have an enormous application potential because of their novel physical and chemical properties which appear upon reduction of the length scales toward a few nanometer. Among the nano-structured materials, *nano-cone* arrays have received particular attention in the last years. Due to their specific structure and properties, nano-cones are attractive for very different applications.

Within this proposal we lay the basis for the electrodeposition of tailored conical nanostructures of ferromagnetic alloys using magnetic fields. By their ability to switch-on and off two different forces of electromagnetic origin, magnetic fields introduce unique possibilities to control the mass transport of both electroactive ions and crystal modifier directly at the conical structures. Based on the expertise of the Polish-German team in magneto-electrochemistry, a novel route toward ordered arrays of ferromagnetic alloy nano- cones with improved physicochemical, in particular electro-catalytic properties shall be established. The results to be obtained may allow for cheaper technologies in the future.

To achieve this goal, the proposal conducts systematic investigations of the relevant electrochemical and hydrodynamics aspects on the full length scale hierarchy from meso to nanoscale. While the German team is in charge to explore the hydrodynamics aspects on of the electrodeposition process on meso- and microscale, the Polish team is responsible for the electrochemistry and the morphological characterization of the convection impact on the nanoscale.