Research project objectives

The aim of this project is generation and full spectral and structural characteristic of dynamic polymers based on reversible covalent bond and metal – ligand coordinative interaction. Project is particularly directed toward the synthesis of a **new class of dynamic polymers** ("dynamers") that contain in their structure three distinct reversible bonds. According to the available literature data, designed system has never been obtained and investigated yet. Designed structure polymer (Fig. 1) will include boronic ester moiety (1st degree of reversibility), the imine bond (2nd degree of reversibility) and bi- or tridentate coordination pocket (3rd degree of reversibility).

Basic research:

Realization of the former project that involved investigation of the composition of dynamic systems based on boronic esters, imines and disulfides bonds [11], was the inspiration for the design of new type of ligands, where apart from the two distinct dynamic covalent bonds (imines, boronic esters), coordination pockets based on O-hydroxyl, N-imines and N – pyridines moieties are also present. It is expected that in the presence of a transition metal ions, generation of coordination architecture will take place as a result of the self-assembly process. Dynamic metallosupramolecular polymer capable to spontaneously response to external stimuli will be obtained. The intended effect of this project is going to be achieved through a combination of efficient synthetic routes in the generation of new dynamic polymeric materials and also by studying of their dynamic character, with particular emphasis on the processes of self-segregation and exchange of components.

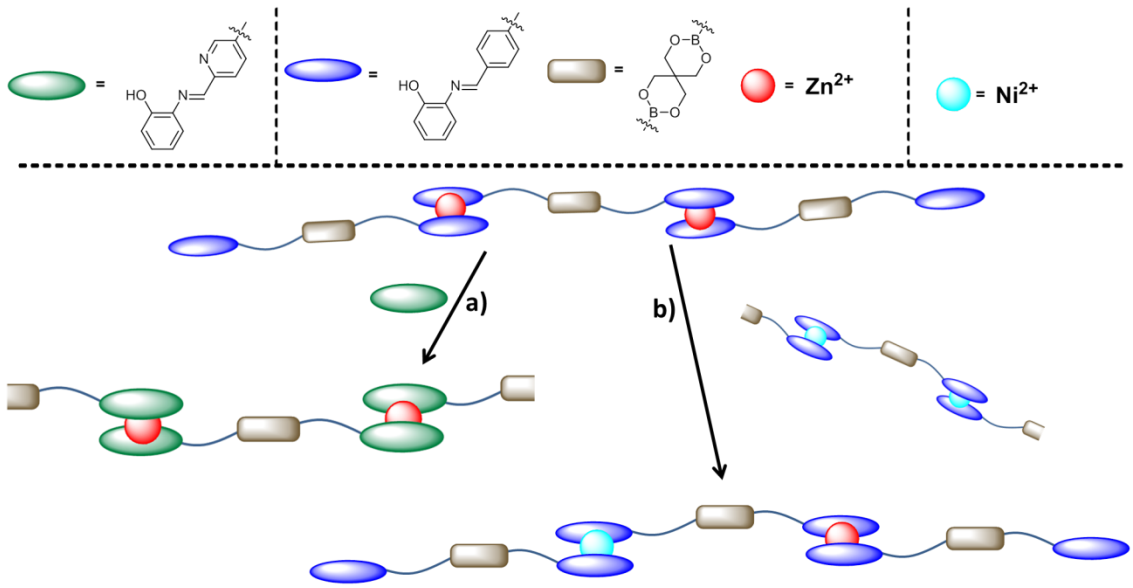

Fig. 2 Schematic representation of dynamic properties of the polymers obtained: a) exchange of chelating unit within the polymer backbone; b) generation of hetero-polymer as a result of exchange/scrambling reaction between two homopolymer units

Research project impact:

Positive results of the proposed research project will be a milestone in the creation of sophisticated multi-component spatial architectures both on micro- (laboratory) and macroscopic (industrial) scale. Moreover, utilization of different synthetic route and depth analysis of dynamic properties obtained structures enable to better determination of individual behavior and preferences of reversible systems. This will contribute to the formation of advanced polymers capable to controlled modification of their structural, optical or mechanical (flexibility) properties.