The aim of this project is the formation of the new type of supramolecular polymer network based on macromolecules being a carrier of molecular “clips” motifs which display high affinity of their mutual selective interactions.

Undertaking the studies subject based on the generation of new type of polymer network results from broad usage of crosslinked polymer materials in diverse areas of people’s lives, from small electronic parts to aircraft elements. Irreversibly crosslinked epoxy resins are the commonly used material. However, difficulties in processing and the lack of possibility of even small change of shape make this materialproperties the great problem to overcome. In consequence, the landfills are covered with damaged and useless polymer products.

Nowadays, absolutely sensible venture undertaken to reduce unnecessary and non-processing materials is designing new class of crosslinked materials, which will be easy to process, keeping favourable mechanical properties. In pursuit of materials, which characteristics resembles properties of crosslinked epoxy resins, polymer networks are formed on the basis of reversible covalent bonds or supramolecular interactions (i.e, hydrogen bonding, ionic interactions). However, until now, nobody used molecular “clips” for the formation of supramolecular polymer network. By any structural change within “clips” system, the strength of homodimers “clips”-“clips” formation can be changed. The unique nature of molecular “clips” relies on the fact that one type of “clips” motif displays high ability of “clips”-“clips” homodimerization in most solvents, whereas another type forms homodimers in selected group of solvents.

Obtaining of the new type of supramolecular polymer network has to be characterized in the detailed way, i.e., determination of mechanical properties of network, viscosity, healing efficiency, definition of conditions enabling efficient repairing of the damaged material (high number of healing cycles (break-heal) maintaining properties of a starting material. Essential matter is the determination of polymer network sensitivity to diverse chemical compounds like solvents. All abovementioned properties of networks can be easily determined by rheological measurements conducted at various temperature conditions.

Rheological measurements will also deliver information about the lifetime of “clips”-“clips” interactions in polymer network based on macromolecules crosslinked at different degree (various molar fraction of “clips” motifs along the macromolecule chain).

Interesting matter is the fact of “clips” homodimer sensitivity to resorcines. Thus this type of polymer network can play a role of sensor sensitive to this type of phenols.