In the era of the plastics dominated world, where they are ‘‘one of the greatest innovations of the millennium’’, it remains a fact that there exists an increasing difference between the capacity of waste plastics generated and the capacity being recycled. The production of plastic wastes in the European Union in 2015 was about 40.6 million tons. Similarly, that year the amount of post-consumer plastic wastes was 25.2 million tons. Therefore, there is a growing social concern associated with the managing of the plastic wastes, which should proceed according to a hierarchical approach in agreement with the following order: waste minimization, reuse, recycling, energy recovery and landfilling. The recyclable thermoplastics as polyethylene, polystyrene, polypropylene and polyvinyl chloride account for nearly 78% of the total plastic waste, while the rest is non-recyclable. Burning and burying of waste polymeric materials cause the severe contamination of soil and air, so the development of environmentally friendly methods for their disposal or effective recycling is very urgent. The conversion of waste polyethylene to fuel composed of lower hydrocarbons at elevated temperature may be the most efficient way to recycle valuable hydrocarbon resources, but a large amount of energy consumption and poor quality of produced fuel retard its commercial operation. The catalyst plays a key role in this type of processes since it allows the cracking temperature to be reduced as well as to address the selectivity towards more valuable products. Selectivity is determined by the acidity and porous structure of the catalysts. Currently, the majority of technologies is based on thermal decomposition of the polymer without the use of catalysts and limited to separated type of resins in mixed resin products, mostly to polyethylene and polypropylene, thus extraction of this fraction from the overall mixture of polymer waste is needed. The main challenge is designing the technology based on catalytic decomposition not requiring waste composting and separation as well as the segregation from chloro-containing fraction.

The final results of the project will concern a complete and effective method of plastic waste cracking over novel hierarchical catalysts with high selectivity to valuable industrial products which can serve as feedstock to an oil refinery or as additives to fuel.