Catalytic processes play a significant role in many branches of modern industry. They assist with the stages of material production, utilisation of harmful substances, and raw materials recovery. This project proposes to develop the concept of catalysts based on intermetallic phases containing aluminium with the addition of metals such as iron, cobalt, nickel and copper. These materials can be used at a crucial stage in the preparation of substrates for polymer production. The success of such a solution would reduce the use of noble metal nanoparticles in this area in favour of cheaper and more readily available catalysts.

The catalytic properties of the proposed materials are due to the presence of active centres in a well-defined structure. Active centres are associated with the presence of transition metal atoms (Fe, Co, Ni, Cu), while the intermetallic structure, characterised by the stability of the relative position of atoms, is due to covalent, ionic or metallic bonds occurring between atoms. Studies carried out confirm that such alloys exhibit the catalytic activity and selectivity resulting from the binding of reactants molecules occurring in the gas phase on the catalyst surface, which allows for an efficient reaction.

The determining factor for catalyst activity is the specific surface area that will participate in the process. Therefore, the aim is to obtain as large surface area per unit of catalyst volume as possible. For this purpose, a process of selective corrosion (dealloying), which relies on chemical or electrochemical removal of a specific component with lower standard potential from the prepared material, will be carried out. As a result of this operation, it is possible to obtain a porous structure containing channels with micrometres diameter and nanometric pores. The channels will allow easy transport of gas reactants, while the variation of pore topography will provide a larger area of adsorption of reactants.

The intermetallic phases of aluminium and cobalt with a quasicrystal structure, based on which the project will be conducted, achieved promising results in catalytic reactions. The project aims to develop this concept by introducing additional elements to increase the stability of the quasicrystal structure, which is necessary for the potential application of such a solution. The materials will be prepared in the form of thin (30-70 μm) rapidly solidified ribbons (melt spun), the surface of which will be modified in the process of dealloying. Achieving the desired results will require optimisation, which consists of choosing the appropriate concentration of the solution, temperature and reaction time. The structure and microstructure of the prepared materials will be examined at the various stages of the manufacturing process to indicate the impact of material properties and the treatment on catalytic properties. The project's intended result is to obtain new catalytic materials based on cheap and easily available metals produced by simple methods that will be a competitive solution in the chemical industry.