An important issue, which is particularly topical, due to the dynamic economic and industrial progress, is the excessive emission of toxic gasses into the atmosphere. One of the most environmentally hazardous groups of chemical compounds are gaseous nitrogen pollutants, such as nitrogen oxides – NO_x (mainly: NO, NO_2). **Nitrogen oxides cause several serious environmental problems**. The negative influence of NO_x relates to the formation of photochemical smog, acid rains and depletion of the ozone layer. Nitrogen oxides also contribute to the problems of global warming and have a harmful impact on human health. As the most dangerous effects caused by NO_x on a human organism one can distinguish cardiovascular and respiratory diseases.

The major contribution of NO_x emission comes from combustion processes in thermal power plants, industrial furnaces, and motor vehicles. In the field of removal of nitrogen oxides emission from stationary sources, the process of selective catalytic reduction of NO with ammonia (NH_3-SCR), is the most commonly applied technique. In the conventional NH_3-SCR system, the catalyst (substance, that increases the rate of a chemical reaction), is located upstream of the electrostatic precipitator (ESP). Therefore, the stream of the gases passing through the catalyst is rich in particles causing its deactivation. The alternative construction of the system requires a reordering of catalytic and ESP units and allows the system to be protected against plugging by dust present in the flue gases, thus resulting in the extending of such system lifetime. The placement of the catalyst downstream of the ESP unit is connected with the decreasing of the NH_3-SCR temperature regime down to 250°C or even lower. The application of the commercial catalyst, V_2O_5/TiO_2 metal oxide system, is limited due to its effective operation range (300-400°C). For this reason, **the crucial challenge in the field of removal of NO_x is to develop a catalyst working in the low-temperature range characteristic of the electrostatic precipitator (ESP) unit operation**.

The main aim of the proposed research project is to design an effective catalyst for **the selective catalytic reduction of NO with ammonia (NH_3-SCR)**, which could be used in the **low-temperature process** of the removal of nitrogen oxides emitted by stationary sources.

The fundamental idea of the planned research is based on the modification of catalytic supports - zeolites (porous materials, alumina-silicates), with selected transition metals (Cu, Fe, Mn) acting as catalytically active components and the addition of promotors accelerating the chemical reaction. In the design of the catalysts, economic aspects constitute one of the most crucial issues. Hence, the application of relatively cheap transition metals, such as Cu, Fe or Mn, is the most attractive route. In the proposed research project, the structure of layered zeolites will be modified by the introduction of heteroatoms (titanium or selected lanthanides e.g. cerium) to obtain catalytic carriers with improved properties. Layered zeolites allow for modifications leading to a more open structure, increasing accessibility to the active centres and the reduction of factors unfavourably affecting the efficiency of the system in the catalytic reactions.

The important part of the proposed research project concerns the study of the physicochemical properties of the obtained catalytic materials. Hence, a deep analysis of its features using various techniques will be performed. The results of these studies will be correlated with the results of the catalytic tests to determine the main properties influencing the catalytic activity of the studied samples.

The design of the catalysts for the low-temperature NH_3-SCR process constitutes a current topic of research in the field of materials engineering, environmental protection and catalysis. The study of the proposed systems contributes to the expansion of knowledge in the field of catalytic application of such materials. Taking into account the principles guiding sustainable development, the reduction of nitrogen oxides emission is extremely important for the present and future generations. The development of highly effective catalyst operating in the low-temperature range should result in retrofitting of the existing SCR installations with the increased stability as well as designing of new solutions adjusted to the rules of green technologies and sustainable development.