Discovery of carbon nanomaterials like fullerenes, carbon nanotubes and graphene significantly contributed to development of modern technology and redirect focus of scientist all over the world to nanotechnology. Nanotechnology is a field of science researching properties and possible routes to improve materials performance at the atomic scale. Potential applications of nanomaterials range from medicine through electronic and finishing on building industry. Race of modern world in miniaturization and breaking performance boundaries in most of nowadays applications implies growth in research and development of nanomaterials and nanotechnology.

Graphene and based on carbon nanomaterials are point of interest of many research groups around the world because of their unique properties (good electrical and thermal conductivity, big specific surface area, good compatibility in use with composites or barrier properties). The biggest disadvantage of graphene is problematic synthesis protocol in a large scale. An alternative cheaper and more safe route than CVD (chemical vapor deposition) to obtain graphene is chemical oxidation of graphite to graphene oxide with further reduction to reduced graphene oxide (properties are not so good as in the case of graphene but they are close to pure graphene). Graphene oxide as a material is a very interesting building block for further research because of functional groups that are present in its structure. In most cases functional groups are easy to process further by using organic chemistry reactions, what allows to modify material properties by exchanging, removing or adding functional groups in GO structure. Graphene oxide based carbon nanomaterials because of their large specific area and being capable to physically absorb and desorb numerous compounds are perfect for further research and development in this particular electronic devices application.

The research task stated in this project concerns synthesis and optimization of graphene oxide based carbon nanomaterials and study possibility to use them as an sensing layer in gas sensing device. Growing air pollution around the world have a large impact on gas sensors development. Scientific problem presented in this project concerns synthesis and optimization of carbon nanomaterials based on graphene oxide from carbon nanotubes and graphite and using them to produce gas sensing layers working in atmospheric (room) conditions. After synthesis graphene oxide base materials will be functionalized and used as an active layer in gas sensing device. Their efficient detection level at ppm and ppb scale is documented in numerous scientific articles, but most of the research are not carried out in atmospheric conditions. Carbon nanomaterials can be used in flexible devices so in future gas sensors based on graphene oxide can be part of everyday cloths. Another point important for gas sensing applications is military-defense system based on explosives or chemical weapon detection.