

Pressure is one of the parameters which influences on behavior and properties of materials. It is known that conditions on the Earth surface are significantly different than those on other planets or in the stars. Various studies of materials are conducted usually at atmospheric conditions, however many substances are deposited deep under the ground or at the oceans' bottom, where pressure and temperature are completely different than those on the surface. These extreme conditions can be recreated in the laboratory by using diamond-anvil cell (DAC). DAC modified in the appropriate way can generate pressure up to tens of GPa. At the same time DAC is simple and safe tool in applying and requires small amounts of studied substances. This small device can be used for structural and spectroscopic studies, as well as for synthesis of new compounds with properties different than those they have at normal conditions, which is very important not only in food, chemical and pharmaceutical industries, but also in seismology and geology, because many minerals have been created deep under the ground at high pressure. Therefore high-pressure studies are significant, because they allow to better understand the behavior of materials at extreme conditions, discover new forms of them, mixed crystals or new materials. The methodology and technique of high-pressure studies are still developing, however there are still many properties of compounds which changes are not well known at extreme conditions, and pressure is one of the most effective tool for changing materials' structure and properties.

The project will include the studies of organic materials at extreme conditions, looking for new forms and solvates with different properties. Organic materials are in a great interests as they are easier in production or disposal. These chosen for studying in this project are the components of medical drugs. On the other hand some of them exhibit explosive properties. Their behavior has been already studied at ambient conditions, however there are no high-pressure studies of their transformations and behavior, which can change them significantly. Studies performed by me on one of them revealed that at high pressure it transform to a new form. Moreover, it appeared to be stable even after releasing pressure to atmospheric value. Therefore, high-pressure research can be very useful in producing new forms of materials.