According to the commonly accepted definition ionic liquids are organic compounds containing mainly ions and characterized by a melting point reduced to 100°C. The unique physicochemical properties of these substances, such as high thermal and electrochemical stability or low vapor pressure, and good miscibility with other solvents have made the use of ionic liquids limited only by our imagination. Proper selection of cation and anion enables the design of ionic systems with potential pharmaceutical importance (as soluble salts) or even electrochemical applications as efficient electrolytes in fuel cells and batteries. Nevertheless, before their commercial use, there is a need to develop and systematize knowledge about the molecular dynamics of these substances, especially under high pressure conditions. Due to the fact that ionic liquids have an unusual tendency to supercooling and glass formation, they are also excellent materials for studying the fundamental aspects of liquid-glass transition.

This project is devoted to thorough understanding of the dynamics of ionic glass-formers, i.e. the mobility of cations and anions in the liquid phase, supercooled liquid and glass. To realize this goal, we will perform the unique and novel studies of transport properties (conductivity, viscosity, diffusion, density) of many ionic materials with different chemical structure in an extraordinary wide range of temperatures and for the first time at very high pressure (up to 2 GPa). We are strongly convinced that this type of research will be the key to the synthesis of ionic glass-formers with extremely high conductivity as well as will bring a breakthrough in the field of condensed matter physics.