Detection of chemicals is extremely important for public safety and in health and environmental protection. Examples include sensing: pollutants and toxins associated with industrial production, explosives and other warfare agents, or biomolecules in medical diagnostics.

The class of compounds we investigate in our laboratory is an excellent candidate for constructing a subtle 'chemical nose' – a sort of 'sniffing unit' whose physicochemical properties change as a result of specific interactions with analysed compounds and this enables sophisticated detection. The scope of this project includes constructing chemosensors based on new mixed-linker metal-organic frameworks (MOFs), materials that combine porous structure with 'binding groups'. Binding of analysed substances to this group can be compared to the 'lock and key' mechanism. Metal-organic frameworks can change their structure by induced fit upon analyte binding. Detection is connected with analyte-induced changes of physicochemical properties of the 'nose' e.g. colour or intensity of luminescence, or electrical resistance.

The designed frameworks can be synthesized via 'classical' methods in solution which consume vast amounts of solvents and energy contrary to the Green Chemistry canon. There is a better approach: environmentally friendly solid-state mechanochemistry, which will be used in this project. This inexpensive and ecological alternative reduces cost and the environmental impact. Thus chemosensors obtained in this way will be affordable and will not affect the natural environment.