

## Dye-free, simultaneous and multianalyte optical recognition using ionic liquid-based polymeric membrane

The vast majority of chemical sensors are based on a ligand that selectively bind ion of interest. The ligand is typically incorporated within a polymer matrix. In addition to ligand, polymer membrane-based chemical sensors normally require an ion-exchanger and if detection is performed using optical spectroscopy, an additional dye. Such membrane can therefore contain up to five components (polymer, plasticizer, ligand, ion-exchanger and dye). In today's trend of drastic miniaturization, cross-contamination of sensors and leaching of active components becomes serious issue and there are many examples of the works trying to reduce/stop the leaching.

In this work we explore the potential for utilization of more universal components that can take several roles thereby reducing the actual *number* of active components while retaining the functionality. An interesting consequence of such approach is their generalization hence introduction of the capability for *simultaneous multianalyte* detection – a concept departing from traditional view of chemical sensors: “one sensor for one ion”.

In our work we use ionic liquids – a remarkable class of compounds that have so far find application in many application areas. We demonstrate their universality by showing that they can behave as ligands, ion-exchangers and plasticizers, **all in the same time**. This allows significant simplification of chemical sensors. Moreover, we demonstrate that a system containing only polymer (PVC) and ionic liquid (behaving as ligand, ion exchanger and plasticizer) is capable of simultaneous recognition of two ions in the same time. Due to the relative ease of ionic liquid synthesis, we envision design of ionic liquids whose functionality can approach today's best ionophore-based sensors.