Minicolloque n° CPR1 (Solvants non-conventionnels) x Oral ☐ Poster

Extracting Ionic Pollutant with Switchable Hydrophilicity Solvent

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Deep eutectic solvents (DES) are mixtures of several compounds with melting temperature far below those of the individual chemicals. While the primary chemicals might not be easily valorised, DES can become a useful solvent because of its low melting temperature and chemical properties. As example, DES could be design from biomass with molecules like urea, betaine or fatty acids.

Hydrophobic DES have been developed for applications like extracting toxic chemical from water. In a liquid – liquid biphasic system, the removal of chemicals necessitates to pass through the interface. This diffusion between the two phases can substantially slow down the process. However, this drawback disappears with switchable hydrophilic solvent (SHS) that are capable to be hydrophobic or hydrophilic depending on the conditions. Temperature and CO_2 are two stimuli able to switch the hydrophilicity of the DES based on lidocaine and oleic acid, as illustrated in Figure 1. The remarkable ability of the solvent to change affinity with water has been explained using infrared spectroscopy: the amount of ions is decreasing substantially when increasing the temperature and the solubility of lidocaine in water is much smaller than the ammonium cation. [1]

Additionally, a first application of the switchable DES was also evaluated with the extraction of ionic dyes. 5 dyes were extracted by SHS DES as well as hydrophobic DES and neat oleic acid. Overall, the presence of high concentration of ions in the DES is improving the extraction of ionic pollutants.[2]

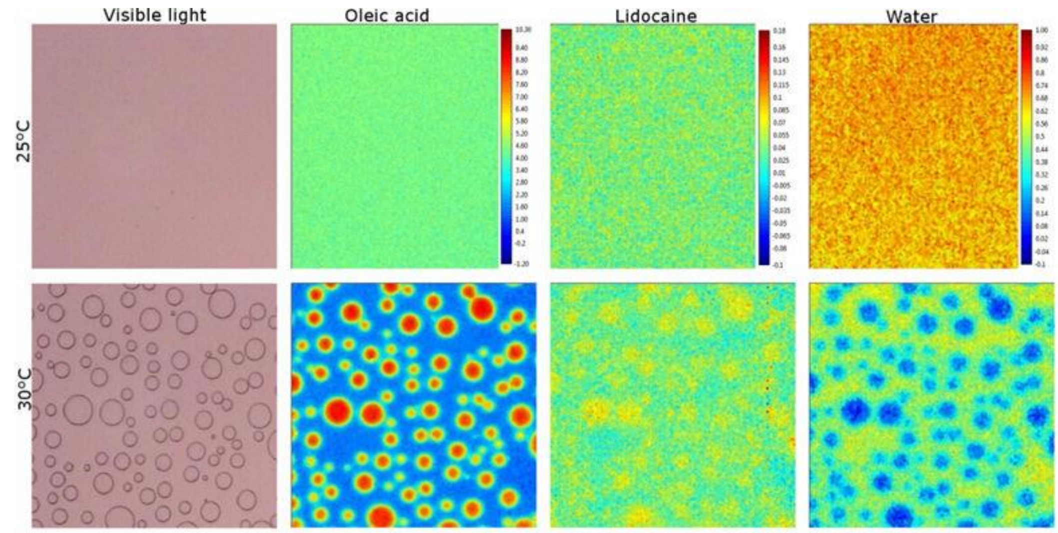

Figure 1 : Illustration of the phase separation induced by temperature in an aqueous DES based on oleic acid and lidocaine. Visible image (left) and FT-IR images at 25 and 30°C. Each image corresponds to an area of 350x350µm. The color scales correspond to the concentration of the different chemicals from low (blue) to high concentrations (red).

[1] O. Longeras *et al.*, ACS Sustainable Chemistry & Engineering 8, 12516 (2020)
[2] O. Longeras *et al.,* New journal of Chemistry, *submitted.*