GREEN SOLVENTS IN CHEMICAL INDUSTRY

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COURSE DESCRIPTION

Solvents occupy a prominent place in the chemical industry and are at the heart of many app lications such as the formulation of paints, inks, phytosanitary products or the industrial clean ing or the extraction, synthesis or separation processes. Several factors are behind the evolu tion of this market towards cleaner and safer solvents, commonly referred to as green solven ts: a context marked by regulations aimed at reducing the impact of products on humans and the environment (including VOC emissions), the depletion of fossil resources, the diversificati on of raw materials, a strategic interest in terms of image for the company and a growing de mand from users for ecological products. This context of change encourages many laboratori es and companies to find alternative solutions with much better Health Safety and Environme nt profiles. Among these green solvents developed in recent years, appear supercritical fluids , ionic liquids, deep eutectic solvents or bio-based solvents. New tools (green chemistry criter ia, guides, prediction tools such as the Hansen Solubility Parameters in Practice software (H SPiP) and COSMO-RS, computer-aided molecular design) to substitute "harmful" solvents h ave also developed in recent years, more effective than the "trial and error" approach. All of t hese elements that may be useful in improved solvency formulations will be presented in this course. The course is orientated for MSc / PhD students and professionals willing to know th e panorama of green solvents and how to find a rational path through their problems.

COURSE AIMS

Let the student acquire knowledge of green solvents and their properties, but also understan d how to use the existing methodologies/tools to choose the right alternative in case-studies.

LEARNING OUTCOMES

On completion of this module, the learner will be able to:

- Demonstrate an understanding of the properties required for a green solvent.
- Apply the solvent substitution methodologies to select the best alternative adapted to the specifications targeted by the application.
- Use HSPiP software and app-based tools for their own solvent selection case studies.

TEACHING METHODS

Fully interactive didactical methods used in the Summer school include:

- Lectures given by senior researchers.
- App-based theory usable on phones, tablets, laptops.
- Group exercises in the classroom on solvent selection by HSPiP software.
- Practical work on biobased solvent eco-design.

CLASS TOPICS

This course, accessible to a broad audience, will be divided into 4 parts:

- Package 1: Introduction to solvents and overview of green solvents.
- Package 2: Hansen Solubility Parameters and the secrets of HSPiP to find green alternatives.
- Package 3: Other methodologies of solvent substitution: COSMO-RS, hydrotropes/solubilizers via Kirkwood-Buff theory, $scCO_2$ entrainers.
- Package 4: Eco-design of biobased solvents.