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Motivation

Biological wastewater treatment employs a (mixed) microbial culture to degrade organic pollutants. During this process, under specific conditions, the microorganisms excrete large amounts of extracellular polymeric substances (EPS). These EPS mainly consist of polysaccharides, proteins and glycoproteins, and have the potential to be applied as value-added products such as (biodegradable) flocculants and biosorbents for metals [1]. To explore these and other applications, it is necessary to develop a recovery process capable of separating different EPS fractions from other compounds present in the wastewater treatment broth.

Technological challenge

Solvent extraction is a promising separation technique to recover EPS and one of the challenges is to identify a suitable solvent. Due to the presence of ionizable functional groups in the EPS structure (e.g. carboxylic and amino groups), polar solvents with a limited affinity for water are required. Our approach is to use ionic liquids (ILs, Fig 1), which are regarded as green solvents because of their low flammability and negligible vapor emission [2]. Other steps in the recovery process is EPS back-extraction from the IL phase and solvent regeneration. This stage will use an aqueous biphasic system, which is created by the addition of a solvent able to induce the coexistence of two immiscible aqueous phase.

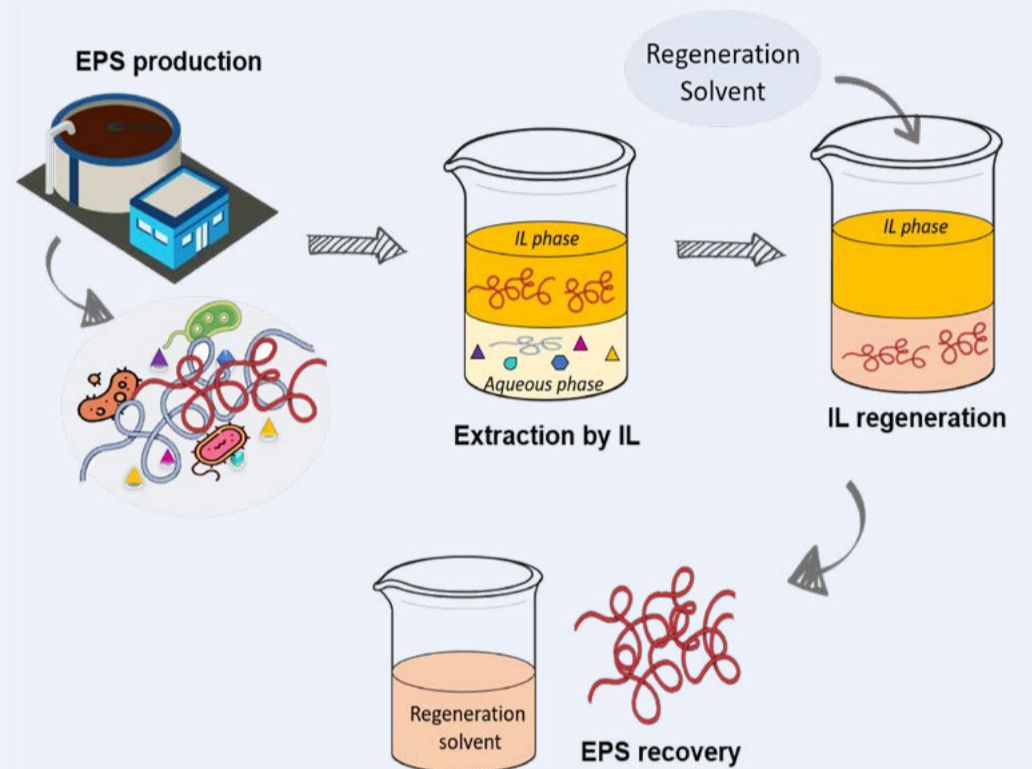


Fig 2. Graphical abstract showing the research approach of the project.

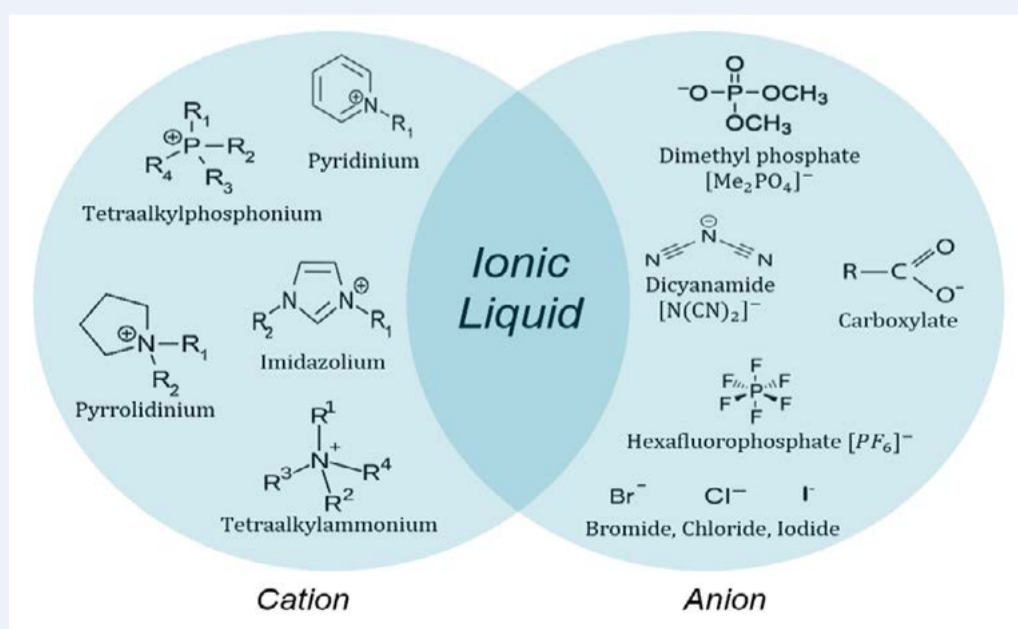


Fig 1. Common cations and anions in ILs.

Research goals

- Identifying suitable ILs for extraction of EPS from the broth;
- Designing an aqueous biphasic system (ABS) for EPS back-extraction and IL regeneration;
- Recovering EPS fractions from the regeneration solvent;
- Investigating the potential of EPS recovered fractions for flocculation process and heavy metal removal.

[1] More et al., J. Environm. Management (2014), 1-25.
 [2] Freire et al., Chem. Soc. Rev. (2012) 4966-4995.



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