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Selective recovery of metal salts from aqueous streams using ionic liquids

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Motivation
The chemical and mining industries produce large aqueous streams polluted with valuable (heavy) metal salts. Numerous groundwater's are polluted with these salts. Economically and scientifically, it is challenging to remove these impurities from the aqueous phase. Conventional methods too selectively recover and purify these metals are too energy consuming or/and use volatile organic solvents and harmful chemicals. To overcome this problem we will develop task specific ionic liquids (ILs).

ILs are defined as organic salts formed by the combination of bulky organic cations with a wide variety of anions that are liquid at room temperature. While classical solvents are made of neutral molecules, ILs are made of large ions which are held together by electrostatic interactions. Because of this, the properties of ILs are considerably different from those of molecular liquids. They have:

• a wide liquid range
• a negligible vapor pressure
• a high chemical stability
• a high electrochemical stability.

To make these solvents specific for their metal extraction task, we incorporate ions which have a functionality that shows a good interaction with metals (Green Chem., 2011, 13, 471).

Technological challenge
The focus of this project is to determine the mechanism of metal extraction with ionic liquids in relation with ion exchange processes. Out of these results, improvements can be made in the synthesis and the type of ILs used. We will also synthesize bio-renewable ILs for metal extraction. Furthermore we will check if we can sustainably regenerate our IL by making use of their broad electrochemical window. This would make chemical regeneration unnecessary.

_from literature: ions that were used to synthesize task specific ionic liquids for metal extraction_