

Evaluating the complexation behavior and regeneration of boron selective glucaminium-based ionic liquids when used as extraction solvents.

Abstract

Glucaminium-based ionic liquids are a new class of solvents capable of extracting boron-species from water with high efficiency. The complexation behavior of these ILs with borate was thoroughly studied using $(11)\text{B}$ NMR. Two different complexes, namely, monochelate complex and bischelate complex, were observed. $(11)\text{B}$ NMR was used extensively to determine the formation constants for monochelate and bischelate complexes. The IL concentration was observed to have a significant effect on the IL-borate complexes. Using an in situ dispersive liquid-liquid microextraction (in situ DLLME) method, the extraction efficiency for boron species was increased dramatically when lithium bis[(trifluoromethyl)sulfonyl]imide (LiNTf_2) was used as the metathesis salt in an aqueous solution containing 0.1M sodium chloride. IL regeneration after extraction was achieved using 0.1M hydrochloric acid. The extraction efficiency of boron species was consistent when the IL was employed after three regeneration cycles. The selectivity of the IL for boron species in synthetic seawater samples was similar to performing the same extraction from Milli-Q water samples.