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Li separation from natural samples using crown-ethers.

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In natural samples the extraction of Li from overwhelming amounts of matrix Na is commonly achieved with several chromatographic steps on sulfonate cation exchange resins using diluted acid media. As the introduction of crown-ethers [1] simplified greatly the separation of elements such Sr, here we investigate the potential of crown ethers for an efficient separation of Li. The 4-Crown-4 are known to fit the size of the Li ion [2]. Although some complex molecules incorporating this crown have a selectivity for Li over other elements higher than 1000 [3], we limited our investigation to di-benzo-14crown-4 (DB14C4) and its close derivatives. Whereas other more selective molecules are not commercially available and their synthesis so far implies many low yield steps, DB14C4 can be synthesized in one or two high yield steps. Here, we dissolved DB14C4 in nitroxylene, which is loaded on a macroporous polymer (grain size ~100 mesh), compatible with ion exchange chromatography. When achieving an ion exchange between an aqueous phase and an organic solvent hosting the crown-ether, an anion has to be extracted along Li+ for charge compensation. In this study a large lipophilic anion derived from the tetraphenyl borate is present in the solvent.

We show how Li is extracted in all HCl acidities from 0.01N to 6N with a selectivity over Na and K above 20. Other elements are not extracted.

A chromatographic procedure has been designed to extract exclusively Li from sample solutions and is presently tested on actual samples. Other possibilities in the usage of crown ethers for the separation of Li exist. Among these a two-step separation can be operated in the following way: a first step on a short traditional cation exchange column and a second step on a short column using a commercial crown ether retaining Na left over in the Li fraction from the first step without retaining Li.

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