Design and solution studies of macrocyclic and amphiphilic polyamines for the extraction and detection of toxic metals

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Exposure to lead-contaminated tap water is a persistent issue in many western countries. In the context of the 98/83/EU directive, we got involved in the design of a cartridge-based purification system that could be mounted directly on a kitchen faucet. Solid-phase extraction by covalent attachment of a lead-selective sequestering agent to the surface of silica gel was thought as an efficient method to reduce the lead level below the new parametric value of 10 µg/l, as shown by pipe-loop tests.[1] High binding affinity, selectivity, and fast uptake kinetics are of crucial importance. This fine-tuning was most conveniently achieved by taking advantage of the outstanding coordination properties displayed by *N*-functionalized tetraazamacrocycles bearing amidic side chains.[2-3] Their structural, thermodynamic, and kinetic characterization will be discussed as well as solid/liquid extraction data.

The outstanding recognition properties of some mesoporous hybrid materials were further exploited for the selective and sensitive detection of lead(II) in water by electrochemical methods.[4] To push the detection limits even further down, up to the ng/l or ppt level, the design of highly sensitive optical chemosensors of lead and mercury based on amphiphilic amide-substituted polyamino-9,10-anthraquinoinones that self-assemble in monolayers will be outlined.[5-8]

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