

## Development of Chelating Resin for High-Throughput Separation of Trace Elements

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### Summary

A chelating resin immobilizing carboxymethylated polyethyleneimine (CM-PEI) has excellent ability for separation of trace elements. The CM-PEI resin can extract some trace elements, such as Ni, Cu, and Mo, over the wide pH range; however, alkali and alkaline earth elements are not collected under acidic and neutral conditions. In this study, it was found that the molecular weight of CM-PEI on the resin affects the rapidity for the extraction of the elements.

The PEIs, which have different molecular weights (ca. 600, ca. 1200, and ca. 10000), were immobilized on a resin, which was prepared by suspended polymerization using glycidyl methacrylate as a monomer and ethylene glycol dimethacrylate as a cross-linking agent. The amino group in the PEI immobilized on the resin was then carboxymethylated using sodium monochloroacetate in the alkaline solution.

The obtained resins had the ability for the selective extraction of the elements described above; almost the same tendencies for the effect of pH on the extraction of the elements were observed in all of the resins. In the effect of flow rate on the extraction of the elements, these resins were able to quantitatively extract Cd, Co, Cu, Fe, Mn, Mo, Ni, Pb, V, and Zn at the flow rate of ca.100 mL/min. Especially, the CM-PEI10000 resin could extract these element quantitatively even in the range of 119 - 154 mL/min. These results indicate that the resin immobilizing CM-PEI, which has large molecular weight, is effective for the rapid extraction of the elements.

The solid-phase extraction (SPE) technique using the CM-PEI10000 resin was applied to separating trace element prior to their inductively coupled plasma atomic emission spectrometric (ICP-AES) determination. The combined method with the SPE and ICP-AES was useful for the analyses of certified reference materials (EnviroMAT<sup>TM</sup> Ground Water ES-L-1, Waste Water EU-L-1, SCP Science). The method was also applicable to the analysis of a commercially available table salt.