

## **288e Binding of Transition Metals to Silica-Bound Branched Poly(Ethyleneimine): a Raman Spectroscopic Study**

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Chelate-forming functionalities are utilized in water purification and fractionation of hydrometallurgical process streams. A wide variety of functional groups have been considered, and polyamines have been found to be especially effective in binding the transition metal cations. Branched polyethyleneimine (BPEI) has potential use in many technical applications. In order to be reusable it has to be made insoluble in solvents, for example by binding it onto a solid silica support. Detailed knowledge of the chemistry of metal ion binding to surface-immobilized ligands is important in order to find optimal conditions for utilization of these materials.

The Raman scattering information from chemical bonds of molecules is very specific and it has been used to investigate changes in chemical bonds. Consequently, Raman spectroscopy offers an opportunity to probe the structure of surface-immobilized metal complexes. Some Raman studies of metal coordination to surface-immobilized ligands have been reported recently.

In the present work, binding of Cu(II), Ni(II) and Zn(II) to silica-bound branched poly(ethyleneimine) has been studied by confocal Raman spectroscopy. A commercial chelating adsorbent WP-1 (Purity systems Inc.) was used and the spectra were measured with a confocal Raman microscope allowing the utilization of the Raman scattering with a specific space resolution.

The effects of pH and metal ion concentration on the metal binding were studied. Also competing binding of two metals was studied and the ratio of the bound metals was estimated from the Raman peaks. The structure of Cu and Ni complexes was also investigated by measuring reflection UV-VIS spectroscopy and the peaks were found to be similar with those obtained for the soluble BPEI in dilute aqueous solutions. Therefore, the Cu and Ni complexes most probably have a tetragonal and octahedral geometry, respectively.