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## Simultaneous preconcentration of cadmium, cobalt, copper, manganese, nickel and zinc with 1-(2-Pyridylazo)-2-naphthol by cloud point extraction followed by neutron activation analysis

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A method for the simultaneous preconcentration of six environmentally relevant transition metals, namely cadmium, cobalt, copper, manganese and zinc, by cloud point extraction followed by their determination using neutron activation analysis (NAA) was developed. The method involved the use of a nonionic surfactant, namely PONPE-7.5, and the chelating agent 1-(2-pyridylazo)-2-naphthol commonly known as PAN for the extraction. Factors that can influence the extraction efficiency of metals, such as solution pH and PAN concentration, were evaluated. The irradiations were performed at the Dalhousie University SLOWPOKE-2 Reactor at a neutron flux of  $5 \times 10^{11} \text{ cm}^{-2} \text{ s}^{-1}$  in the inner pneumatic sites. Samples were irradiated in heat-sealed polyethylene irradiation vials. Two different irradiation-decay-counting (ti, td, tc) schemes were employed considering the half-lives and sensitivities of the elements of interest: 10 min, 1 min, 10 min for Cd, Co, Cu and Mn, and 3h, 1h, 2h for Ni and Zn. Quantitative recoveries ( $> 96\%$ ) were obtained for all the elements in a single extraction step under optimal conditions (pH 8-9, CPAN =  $5 \times 10^{-5} \text{ M}$ ). A preconcentration factor of 70 was achieved leading to detection limits of the order of nanogram per mL. The method was validated using NIST SRMs. The precision and accuracy of measurements were within  $\pm 10\%$ . The CPE method developed here can be used to simultaneously preconcentrate trace metals from aqueous samples in only one-step reducing the possibility of contamination, while the use of NAA allows multielement determinations.

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