Application of ion chromatography for the assessment of cadmium adsorption in simulated wastewater by activated carbon

Mutah Musa\textsuperscript{a}, Akira Kikuchi\textsuperscript{a,∗}, Nor Eman Ismail\textsuperscript{a}, Jafariah Jaafar\textsuperscript{b}, Zaiton Abdul Majid\textsuperscript{b}, Mohd R. Salim\textsuperscript{a}, Kazuhiko Tanaka\textsuperscript{c}

\textsuperscript{a}Institute of Environmental and Water Resources Management, Universiti Teknologi Malaysia, Johor Bahru, Malaysia
Tel. +6075531725; email: akira@utm.my
\textsuperscript{b}Faculty of Science, Department of Chemistry, Universiti Teknologi Malaysia, Johor Bahru, Malaysia
\textsuperscript{c}Graduate School for International Development and Cooperation, Hiroshima University, Hiroshima, Japan

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\textbf{ABSTRACT}

A separation for Cd\textsuperscript{2+} and its interferences of common cations (Na\textsuperscript{+}, NH\textsubscript{4}\textsuperscript{+}, K\textsuperscript{+}, Mg\textsuperscript{2+}, and Ca\textsuperscript{2+}) was performed. Cation-exchange ion chromatography for Cd\textsuperscript{2+} and common cations separation on a weakly acidic H\textsuperscript{+} forming cation-exchange resin was investigated and applied to test the efficacy of activated carbon in the removal of Cd\textsuperscript{2+} from simulated wastewater. The difference of retention volumes between Ca\textsuperscript{2+} and Cd\textsuperscript{2+} was 0.45 mL for oxalic acid with a concentration of 1.75 mM, and the retention volume drastically decreased when the oxalic acid concentration increased in the eluent. Considering the prevailing conditions for TOSOH TSK gel Super IC A/C at 40˚C with a least pH limit of 2.0, 1.75 mM of oxalic acid was selected for rapid analysis with pH of 2.3. Applying 50 μL sample injection, the calibration curve was linear for tested standard samples ranging from 0.05 to 2.0 mg/L, the detection limit (S/N = 3) was 0.066 mg/L (0.583 μM), and the analysis was applicable with coexisting Ca\textsuperscript{2+} up to 10.0 mg/L (250 μM) while other cations did not interfere. It was possible to analyze three samples within an hour. The application of this method on Cd\textsuperscript{2+} adsorption indicated the effectiveness of the method for heavy metals' analysis.

\textit{Keywords:} Activated carbon; Cadmium; Cation-exchange; Ion chromatography; Oxalic acid

*Corresponding author.