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Surface enhanced Raman spectroscopy as a new spectral technique for quantitative detection of metal ions

By: Temiz, HT (Temiz, Havva Tumay)[1] ; Boyaci, IH (Boyaci, Ismail Hakki)[1,2] ; Grabchev, I (Grabchev, Ivo)[3,4] ; Tamer, U (Tamer, Ugur)[5]

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Abstract

Four newly synthesized poly (propylene amine) dendrimers from first and second generation modified with 1,8-naphthalimide units in the dendrimer periphery have been investigated as ligands for the detection of heavy metal ions (Al^{3+}, Sb^{2+}, As^{2+}, Cd^{2+} and Pb^{2+}) by surface-enhanced Raman spectroscopy. Calibration curves were established for all metal ions between the concentration ranges of $1 \times 10(-6)$ to $5 \times 10(-4)$ M. It has been shown that these dendrimers can be coordinated, especially with different metal ions. Using dendrimer molecules and silver colloids at the same time allowed us to obtain an SERS signal from the abovementioned metal ions at very low concentrations. Principle component analysis (PCA) analysis was also applied to the collected SERS data. Four differentPCA models were developed to accomplish the discrimination of five metal ions, which interacted with each of the four dendrimer molecules, separately. A detailed investigation was performed in the present study to provide the basis of a new approach for heavy metal detection. (C) 2013 Elsevier B.V. All rights reserved.

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Author Information

Reprint Address: Boyaci, IH (reprint author)

➕ Hacettepe Univ, Fac Engn, Dept Food Engn, Beytepe Campus, TR-06800 Ankara, Turkey.

Addresses:

➕ [1] Hacettepe Univ, Fac Engn, Dept Food Engn, TR-06800 Ankara, Turkey

➕ [2] Hacettepe Univ, Food Res Ctr, TR-06800 Ankara, Turkey

[3] Sofia Univ St Kliment Ohridski Fac Med, Sofia 1407, Bulgaria

➖ [4] King Abdulaziz Univ, Dept Chem, Fac Sci, Jeddah 21589, Saudi Arabia
  Organization-Enhanced Name(s)
    King Abdulaziz University

➕ [5] Gazi Univ, Dept Analyt Chem, Fac Pharm, TR-06330 Ankara, Turkey

E-mail Addresses: ihb@hacettepe.edu.tr

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