UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

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URI

"Use of Magnetic Nanoparticles for the Determination of Heavy Metals"

HOST

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Use of Magnetic Nanoparticles for the Determination of Heavy Metals

Abstract

The presence of heavy metals in environmental samples has been a problem for a long time as accidental ingestion (or exposure to) of these heavy metals can lead to chronic and acute health problems in both humans and animals. Quantification of the level of toxic heavy metals in samples such as water, vegetation, soil, fertilizer, etc. has been of importance in order to define standards which need to be met prior to human or consumption. The conventional analysis method of acid digestion followed by FAAS and ICP-MS does not give accurate or consistent results due to limit of detection problems. Therefore, methods of pre-concentration have been of vast interest. One such method includes the use of polymeric magnetic nanoparticles. These nanoparticles consist of vinyl functionalized Fe_2O_3 and magnetic heavy metal ion imprinted nanoparticles which can selectively trap the specific heavy metal of interest in a "lock and key" method similar to how enzymes work in biological samples. These trapped heavy metals can be eluted using an acid such as $HClO_4$ and HNO_3. The eluted cations can then be analyzed by FAAS and/or ICP-MS. Another method of pre-concentration introduces the use of task specific ionic liquids combined with Fe_2O_3 magnetic nanoparticles. This can be used as a rapid simple solid phase sorbent for heavy metals. Similar to the previous method, FAAS was performed to determine the final heavy metal content. The LOD for the previous method was found to be 0.09µg/L and 0.5µg/L for the latter.

References:

1. Ebrahimzadeh, H., Kasaeian, M., Khalilzadeh, A., & Moazzen, E. (2014). New magnetic polymeric nanoparticles for extraction of trace cadmium ions and the determination of cadmium content in diesel oil samples. *Analytical Methods*, *6*(13), 4617–4624. doi:10.1039/c4ay00201f

2. Mehdinia, A., Shegefti, S., & Shemirani, F. (2015). A novel nanomagnetic task specific Ionic liquid as A selective sorbent for the trace determination of cadmium in water and fruit samples. *Talanta*, TALD1501812. doi:10.1016/j.talanta.2015.08.012