含鐵奈米多孔材料回收與監測鉈

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市場及需求:

近年來，新興科技元素於各領域的需求與日俱增，其中，鉈於高科技工業、醫學應用與民生工業的應用廣泛，但其產地有限，因此鉈的回收再利用受到高度重視；此外，鉈會經由採礦、冶礦、燃煤與水泥製造等人為活動進入環境，因而經常在環境中被檢出，鉈對生物與人類具高毒性且無法被微生物降解。目前可用於回收鉈的吸附劑大多專一性不足且具毒性，或是吸附容量有限與環境適用性低，因而面臨無法有效處理與監測環境中鉈污染與毒性移除的問題。此含鐵奈米多孔材料無毒，對鉈吸附容量高、具明確的專一性吸附機制且基質干擾低，不但可以應用於污染場址的復育，以降低鉈污染對環境與人體健康的影響，也可有效回收再利用新興科技元素。目前尚無技術或設備可監測鉈對人體的生物可及性以及生物有效性，含鐵奈米多孔材料衍生之仿生物裝置可用以評估鉈的生物監測與毒性危害。

技術摘要(含成果):

本技術合成含鐵奈米多孔材料作為吸附劑，可用於移除水體或其他環境基質之鉈污染，包括礦區、醫院、高科技產業或民生工業廢水或放流中之鉈金屬回收，或是因冶礦、燃煤、水泥製造或人類活動等相關鉈污染環境的復育，以降低鉈污染對環境與人體健康的危害；其衍生之仿生物裝置可用以監測環境水體鉈污染的生物有效性，以及毒性危害性評估。

優勢:

作為鉈高效吸附劑的含鐵奈米多孔材料，不但有較低廉的價格，相較於其他吸附劑，它更有無毒、高吸附容量與專一性吸附的優勢，其衍生之仿生物裝置可以監測鉈的生物可及性與生物有效性。

競爭產品:

使用化學性與生物性吸附劑，或是以奈米顆粒吸附鉈的相關材料與應用。

專利現況:

(1) 本團隊於廢棄物中回收有用資材與再應用擁有領先的技術。

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Recovery and monitoring of thallium with porous iron-based nanomaterials

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Market Needs:
With the rapid development of new technology, a series of technology-critical elements (TCEs) are increasingly being produced and used in various fields worldwide. In market, thallium (Tl) is one of most commonly used TCEs with wild applications in high-tech industries, medical purposes and manufacturing of daily care products. Because sources of Tl-containing ores are limited around the world, the recovery and recycling of Tl from the solid waste or wastewater have raised attention. Besides, Tl enters the environment through human activities, mainly due to smelting and burning of coal mines, cement manufacturing and wastewater discharge from those Tl-related manufacturing or medical units. Because Tl is non-biodegradable and highly toxic to biota, it is an emerging pollutant with prior concern. An effective sorbent for removing toxic Tl from contaminated sites is urgently needed and can be further used for biomonitoring of environmental Tl pollution.

Our Technology:
As compared to the reported sorbents for Tl removal, this porous iron-containing nanomaterial has homogeneous compositions containing large surface areas and consistent nanoscale sizes of inner pores, which contribute the specific sorption mechanism for Tl.

Strength:
The porous iron-containing nanomaterial is not toxic and shows high capacity, specificity and efficiency on Tl sorption in in contaminated water with low interference by natural matrices. The derived device is promising as a novel tool not only being used to remove and recover Tl from contaminated environmental matrices, but also for monitoring of bioavailability and toxicity of Tl to the exposed biota.

Competing Products:
Other sorbents or nanomaterials for binding Tl.

Intellectual Properties:
(1)Our group has years of research experiences in converting waste into high-value products.

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