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Separation of Cu radioisotopes from a nickel target using cation-exchange chromatography

Xianfeng Fan[1] and **David J Parker**[2]
[1]The University of Edinburgh, UK
[2]The University of Birmingham, UK

Copper radioisotopes have been used in nuclear medicine and in positron emission particle tracking. The separation of copper radioisotopes from a nickel target has been conducted through solvent extraction or anion exchange. However, anion exchange methods consume a large amount of chemicals, and after separation the residual nickel in the radioactive products is at quite a high level which may be harmful to human health. A commonly held opinion is that cationic exchangers have very similar thermodynamic complexation constants for metallic ions with identical charges, therefore making the separation very difficult, or impossible. Our research indicates that an effective separation can be achieved by ammonium modified Chelex-100. The selectivity of Chelex-100 for Cu and Ni ions not only depends on its thermodynamic complexation constant, but also markedly varies with the concentration of mobile H+, the structure and arrangement of the polymer chains. Through controlling the intermolecular interaction of the polymer bed, over 99.9% of Ni was stripped out, but 100% of copper radioisotopes remained in the separation column. The separation is much more effective, simple and economical in comparison with the common method of anion exchange. This significant improvement will make subsequent labelling much easier, and reduce the uptake of Ni and chelating agents by patients, therefore both the stress on human body associated with clearing the chemicals from blood and tissue, and the risk of various types of acute and chronic disorder due to exposure to Ni.

Biography

Xianfeng Fan is a senior Lecturer and leads a research group with 8 members in the Institute for Materials and Processes, School of Engineering at The University of Edinburgh. He obtained a PhD degree from the University of Birmingham and then worked as a Research Fellow in the Birmingham Positron Imaging Centre for 8 years. He previously worked on colloidal and interfacial phenomena, materials separation, positron emission particle tracking and powder technology. He has authored or co-authored over 160 journal and conference publications.

X.Fan@ed.ac.uk

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