

Development of Laser Ablation Inductively Coupled Plasma – Mass and Optical Emission Spectrometry Methodologies for Elemental Analysis in a Medium Active Cell Environment

Ryan Devlin¹, Clive Lythgoe² and Simon Chenery³

¹*National Nuclear Laboratory, Seascale, UK*

²*Sellafield Ltd, Seascale, UK*

³*British Geological Survey, Nottingham, UK*

Corresponding author: Ryan Devlin <ryan.m.devlin@nnl.co.uk>

As Post Operational Clean Out and Decommissioning become more prevalent on the Sellafield Site, there is a requirement for a new analytical facility to be developed. Sellafield Ltd, National Nuclear Laboratory (NNL) and Axiom are developing existing High Active (HA) facilities and constructing a new Medium Active (MA) cell suite within NNL's Central Laboratory. A key part of this project is the development of technologies that Sellafield Ltd and NNL have not previously implemented in a HA/MA cell environment. Examples of new technologies include Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) and Laser Ablation Inductively Coupled Plasma Optical Emission Spectroscopy (LA-ICP-OES).

LA-ICP-MS/OES is a well-developed technique for the elemental analysis of solid materials. The capability to directly analyse solids would greatly eliminate the need to perform dissolutions on samples, reducing the amount of liquid waste generated through analysis. The requirement for sample preparation within the MA cell can cause difficulties as it will need to be undertaken using a form of remote handling. Uncertainties surrounding analytical capability of the techniques also require reviewing to ensure that customer expectations and quality requirements can be met.

In order to determine the validity of LA-ICP-MS/OES, British Geological Survey (BGS) were commissioned to perform a series of investigations into potential sample preparation techniques, including their applicability within a MA cell. Sample preparation techniques which showed promise were then used to analyse certified reference materials and the quality of analysis achievable reviewed for both LA-ICP-MS and LA-ICP-OES.