
6 Analysis of Slag and Fuel Samples from Smoo Cave by *E Photos-Jones*

Three slag and fuel samples from Smoo Cave (all from shell midden, contexts 006a/b) were subjected to scientific investigation in order to establish their nature and composition. The full report is included in the archive report, and a summary of the results is given here.

6.1 Methodology

Scientific examination was carried out with a scanning electron microscope to which was attached an energy dispersive analyser (SEM-EDAX). One sample (SM2) was cut, mounted on metallographic resin, ground with silicon carbide papers (Struers 260, 600, 800 and 1200) and polished with six-micron diamond paste. A freshly fractured surface was cut from the other two and mounted on a stub. All three were carbon-coated in preparation for analysis (at 20kV and WD 39).

6.2 Results

SM2 This fragment of slag is brownish black, porous and light. It is very inhomogeneous, comprising areas that are mineralogically distinct and others that are amorphous. Fuel (charcoal) inclusions are

also evident, as well as areas of extensive weathering due to burial in a damp environment. Overall, the sample is very rich in iron, which occurs in two phases, either as wustite (iron oxide, FeO) or as iron silicate (fayalite, $2\text{FeO}\cdot\text{SiO}_2$). The abundance of iron in these two particular phases suggests iron-smithing slag. However, work on traditional bloomery-making in the Highlands has revealed a relatively high percentage of iron (60–70% FeO) in what is certainly tap slag from a smelting cycle ([Photos-Jones et al forthcoming](#)).

SM3 This fragment of wood charcoal proved to be rich in calcium. Sulphur and phosphorus are also present in significant amounts and these can either be associated with the fuel or may be derived from impurities obtained in the course of deposition.

SM1 This fragment of ore or flux has a honeycomb structure like that encountered elsewhere in the course of the writer's analytical work on bloomery slags ([Photos-Jones et al 1998](#)). They appear as inclusions in smelting slag and some of them appear not to lose their characteristic structure even after being heated to temperatures prevalent in a bloomery furnace. The precise nature of this material is yet to be established.