

Non-destructive elemental analysis of a carbonaceous chondrite with direct current Muon beam at MuSIC

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Electron- or X-ray-induced characteristic X-ray analysis has been widely used to determine chemical compositions of materials in vast research fields. In recent years, analysis of characteristic X-rays from muonic atoms, in which a muon is captured, has attracted attention because both a muon beam and a muon-induced characteristic X-ray have high transmission abilities. Here we report the first nondestructive elemental analysis of a carbonaceous chondrite using one of the world-leading intense direct current muon beam source (MuSIC; MUon Science Innovative Channel). We successfully detected characteristic muonic X-rays of Mg, Si, Fe, O, S and C from CI chondrite, of which carbon content is about 3 wt%. Because of its high sensitivity to carbon, non-destructive elemental analysis with a muon beam can be a novel powerful tool to characterize future returned samples from carbonaceous asteroids.

Keywords: muon, non-destructive elemental analysis, Hayabusa2