Application of QEMSCAN for the interpretation of textures and minerals in extra-terrestrial materials

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Abstract

Automated mineralogy is a rapidly growing field, with new technologies coming onto the market. The effectiveness of this technique to the mining industry for process controls and mineralogical analysis of ore has been clearly shown in the past. However, it has only seen small uses in other fields of sciences, such as meteoritics.

Currently mineralogy in the field of meteoritics has been dominated by non-destructive optical analysis of thin sections, combined with bulk chemical analysis, and more recently powder XRD. However, these techniques are labour-intensive and require complex sample preparation, and the link between observed mineralogy, textures and analysis is indirect, making the interpretation of very fine grained mineralogy commonly affected by secondary processes and complex textures difficult.

Here we present results from the on-going development of a non-destructive method for determination of meteoritic mineralogy and textures, via QEMSCAN analysis of carbonaceous chondrites and iron meteorites. The ultimate aim of this work is the development of procedures to distinguish between textures and minerals formed within meteorite inclusions, such as CAI and chondrules that may have formed within the solar nebula, and matrix minerals that may have formed within disrupted differentiated planetesimals.

Ly, Chi V., D.R. Nelson, A. Biondo and K. Mason (2007) Application of QEMSCAN for the interpretation of textures and minerals in extra terrestrial materials. Automated Mineralogy 07, Brisbane, Australia, September 1-2, 2007