3D MICRO-TOMOGRAPHY OF CARBONACEOUS CHONDRITES AND THEIR COMPONENTS. D. C. Hezel, R. Abel and S. S. Russell. IARC, The Natural History Museum, Department of Mineralogy, Cromwell Road, SW7 5BD, London, UK. E-mail: d.hezel@nhm.ac.uk.

Introduction: The structure of a meteorite, such as the spatial distribution and the modal abundances of individual components are fundamental information. So far, this information was obtained from 2D thin sections. It is unclear to what extent this 2D information is representative of the 3D object. The field of stereology has been developed in order to address and quantify this problem [1,2]. [3] calculated the errors of chondrule bulk chemical compositions obtained from 2D sections relative. These calculated errors can be very large and make interpretations of 2D structural data difficult and sometimes even impossible. [4] recently demonstrated the fallacies when too small 2D sections are used to obtain 3D structural data. Serial sectioning can be applied to directly access the 3D structure of a meteorite, however, this is a laborious and destructive method [5,6].

A recent approach is synchrotron X-ray tomography [7-10]. This precise technique, provides high quality data that allows the quantification of modal abundances, size distributions and spatial relationships. However, there are only few synchrotron facilities around the world and beam time is limited and expensive.

Here we use micro-CT in order to access the 3D structure of chondrites and their components.

Technique: The Natural History Museum (NHM) recently purchased a state of the art industrial micro-CT scanner (Metris X-Tek HMX ST 225). Micro-CT produces 2D representations of a slice of an object based on material density, measured by X-ray transmissions. The resulting slice is made up of voxels, i.e. three dimensional pixels. The size of the voxels largely determines the resolution of a scan which is in the order of 3-5µm. Each voxel is assigned a CT (grey) value derived from a linear attenuation coefficient (i.e. density) of the material being scanned. Hence, a micro-CT scan is not a true image, unlike a radiograph, but rather a mathematical representation of an object. As a result it is very easy to collect measurements such as volume fraction, spatial distribution or orientation of a material within an object. Movies can be produced to reveal the 3D structure of the meteorite.

Results: We used ImageJ to measure modal abundances of opaque phases in Allende (CV; [11]) and NWA 801 (CR). Modal abundances of opaques in 7 Allende chondrules range from 0.0 to 6.5 vol% and in 7 NWA 801 chondrules from 1.7 to 7.0 vol%. This data are important to determine the origin of chondrule and matrix metal as well as for interpreting the Fe isotopic composition of bulk chondrules [11]. We are currently in the process of scanning more samples in order to obtain structural data such as metal abundance in chondrules, component modal abundances, number of compound chondrules, structure of individual chondrules, etc. The results will be presented at the conference.

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