

CAN NOBLE GAS COMPOSITION OF CHONDRULES BE USED TO ESTIMATE DEGREE OF METAL AND SILICATE SEPARATION? J. P. Das ¹Department of Physics, Campus Box 1105, Washington University, 1 Brookings Drive, Saint Louis, MO 63130, USA., jdass@physics.wustl.edu

Introduction: Chondrules are abundant constituent of most of the chondrites [1]. It is widely accepted that chondrules were formed by flash heating of preexisting solids. These precursors can be silicates, metal phases, organic matter and presolar grains. Temperature necessary to melt chondrules completely is about 1800 to 2100 K [1]. Certainly, at this high temperature most of the precursors phases lost the preexisting characteristics and resetting/homogenization should be the most obvious outcome at the end of chondrule formation. However, it is well known that chondrules are heterogeneous [1]. Fractionation between phases is also expected during high temperature chondrule forming event. As for example, metal phases melt at lower temperature compared to silicates. The loss of molten metal phases is expected during chondrule formation. Quantifying the loss of metal during chondrule formation can provide an important constraint for the chondrule formation mechanism.

Discussion: Noble gas carriers present in chondrule precursors were carried by different mineral phases. As for example, it is likely that phase Q, carbonaceous in nature [2] was carried in metal/metal sulfides. Matrix like material is a probable chondrule precursor [3].

Separation of metal and then loss of metal during chondrule formation is proposed based on noble gas study of chondrule phases [4]. It seems possible to use isotopically well defined noble gas component to calculate the proportion of metal expelled from the chondrules during their formation. However, heterogeneity in chondrule precursors especially with respect to their host matrix may obstruct the quantification. Additionally, the loss of metal during chondrule formation may not be significant to quantify the removal of metal/metal sulfides assuming matrix composition as starting precursor composition. With the help of high sensitivity mass spectrometers noble gas analyses of metal phases in chondrules and their comparison with matrix metal can be used to investigate the possibility of using noble gases to quantify metal and silicate fractionation in chondrules.

References: [1] Lauretta D. S. et al. (2006) *MESS-II*, 431-459. [2] Ott U. et al. (1981) *GCA* 45, 1751-1788. [3] Connolly et al. (2001) *GCA* 65 4567-4588. [4] Vogel N. et al. (2004) *Meteoritics & Planet. Sci.* 39:117-135.