OXYGEN ISOTOPE EVIDENCE FOR THE ORIGIN OF HEDs AND ANGRITES. R C Greenwood, I A Franchi, A Jam-bon 

Introduction: HEDs and angrites represent distinct suites of mafic igneous rocks formed early in the history of the Solar System [1]. Despite their mineralogical and chemical differences both groups have similar O-isotope compositions [2]. To examine the origin of HEDS and angrites we have undertaken a high-precision study of their O-isotope systematics.

Experimental Techniques: Oxygen isotope analyses were undertaken by infrared laser-assisted fluorination [3]. Samples were fused prior to fluorination. O₂ was analyzed using a Micromass Prism III dual inlet mass spectrometer. Precision is ±0.04‰ for δ¹⁷O, ±0.08‰ for δ¹⁸O and ±0.025‰ for ∆¹⁷O [3]. Meteorites studied: Diogenites: Bilanga (4), Johnstown (4), Shalka (2), Tathouaine (2), Eucrites: Pasamonte (5), Juvinas (2), Padvarnika (2), Sioux County (2), Stannern (2), Moore County (2), Howardites: Kapoeta (2), Pavlovka (2), Molteno (2), Angrites: Angra dos Ries (4), LEW 86010*(2), D’Orbigny*(2), NWA 1296* (2). (all falls except as indicated by an asterisk, number of replicate analyses in brackets).

Results: Angrites and HEDs plot as distinct groups (Fig 1) and define single mass fractionation lines (Δ¹⁷O = –0.056±0.007 for angrites and –0.220±0.012 for HEDs). Previous studies have indicated that Angra dos Reis has an O-isotope composition indistinguishable from HEDs [2]. Using two distinct sub-samples we have found it to have a Δ¹⁷O value of –0.065±0.009 and plots in the angrite field (Fig. 1). Eucrites and diogenites plot at either end of the HED array (Fig. 1), while howardites occupy a more central position. The large error bars for δ¹⁸O reflect the inhomogeneous, coarse-grained nature of HEDs, with diogenites having grain sizes in excess of 5cm [1].

Discussion: Experimental work indicates that either an angritic or eucritic melt can be produced from a chondritic parent simply by partial melting under differing conditions of oxygen fugacity [1]. Thus a single asteroid might be capable of producing both the HEDs and angrites. However, O-isotope data indicates that this is highly unlikely and that both suites must come from distinct parent bodies. Furthermore, as both fall on well-defined mass fractionation lines only a single parent body per group is required. Finally, in contrast to recent suggestions [4], O-isotope data presented here clearly demonstrates that Angra dos Ries is an angrite.