# PETROGENESIS OF ANGRITES FROM CHONDRITIC PRECURSORS

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Angrites which are pristine basaltic meteorites provide us a window into the earliest stages of the thermochemical evolution and differentiation of rocky bodies in our solar system. These enigmatic achondrites form the largest group of extra-terrestrial basalts after the Moon, Mars and asteroid 4-Vesta. Some previous works have even proposed that angrites could have originated from Mercury [1,4].

Angrites are classified as differentiated achondrites, which are grouped into rapidly cooled volcanic or quenched angrites, and slowly cooled plutonic angrites. Angrites are refractory element enriched (Al, Ca) and volatile element depleted (Na, K) achondrites. Their age (4564 Ma) is only 4 Ma older than the CAIs that are commonly considered as the first solids to have formed in the solar system [3], which makes them extremely suitable for investigating early solar system processes.

The nature and composition of the parental magma from which angrites evolved from, is still largely unconstrained. This work has been carried out in order to understand the partial melting and fractional crystallization behaviour of angrite parent body (APB), resulting in the formation of angrites, and compares the bulk composition of angrite meteorites with model compositions derived using thermodynamic and experimental petrology data, to shortlist the most plausible parent body composition for angrites. Allende CV3 chondrites [2], have previously been proposed as analogues for the bulk composition of the angrite parent body (APB). A modified CV composition after adjusting the composition for metal-silicate differentiation in the APB [5] was selected as a potential composition for the APB. Results show that in terms of main mineral phases, olivine crystallized first at 1628°C followed by feldspar at 1177°C and clinopyroxene at 1129°C respectively, which are in agreement with the mineral phases observed in angrites [2]. Preliminary results indicate that the melt component after ~70% of equilibrium crystallization (1130°C) provides the closest match (in terms of major oxides) to the range of bulk compositions observed in angrite meteorites.

**References:** [1] Irving A. J. et al. 2006. *American Geophysical Union Fall Meeting*, Abstract #P51E-1245. [2] Jurewicz et al. 1993. *Geochimica et Cosmochimica Acta* 57:2123-2139. [3] Kleine et al. 2012. *Geochimica et Cosmochimica Acta* 84:186-203. [4] Kuehner S. M. and Irving A. J. (2007) *Lunar & Planetary Science Conference*, Abstract #1522. [5] Steenstra et al. 2017. *Geochimica et Cosmochimica Acta* 212:62-83.