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# Silicon isotope composition of angrites inherited from early condensation in the protoplanetary disk

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Angrites represent a unique group of achondrites characterized by their enrichment in refractory elements, together with an extreme depletion in moderately elements. Their low $SiO_2$ content and their high oxygen fugacity compared with most of meteorites also suggest a distinct major element chemistry. The processes that have led to these singular characteristics are poorly constrained: they may be associated to nebular processes or to processes that occurred during or after accretion such as core formation, impacts or magma ocean. The Si isotope composition of angrites have previously been reported in the literature as an attempt to better constrain the evolution of the angrite parent body (APB) [1, 2]. No consensus about the isotope composition of angrites and the origin of this signature has been reached yet.

In this study, we have measured the Si isotope composition of six angrites including three volcanic angrites (D'Orbigny, Sahara99555, NWA12320) and three plutonic angrites (NWA4590, NWA4801, NWA10463). The light and homogeneous $\delta^{30}Si$ values of angrites favor early nebular processes. We modelled both the chemical and isotope composition of the first condensates that would form in a solar and in a dust rich environment using the FactSage software [3]. Our modelling of condensation in a high dust to gas ratio environment shows that the APB could represent these early condensates, accreted in a dust enriched environment that produced a higher oxygen fugacity, typical of angrites. The major element composition of partial melts of the calculated APB mantle overlap with the composition of angrites. Thus the Si isotope composition of angrites combined with thermodynamic modelling provides new clues about the origin of this meteorite group.

[1] Pringle et al. (2014), *PNAS* 48, 17029–17032 [2] Dauphas et al. (2015), *Earth and Planetary Science Letters* 427, 236-248 [3] Morbidelli et al. (2020), *Earth and Planetary Science Letters* 538, 116220.