# Constraints from oxygen isotopes on the provenance of material in the solar nebula: Case study of ureilite meteorites

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Using oxygen isotope signatures to constrain the building blocks of terrestrial planets has been a standard approach [1,2]. Ureilite meteorites are ultramafic achondritic meteorites composed largely of olivine and pyroxenes, that are thought to have been derived as residues of partial melting within the mantle of a carbon-rich asteroid [3]. These meteorites display a wide range of oxygen isotope signatures that distinguishes ureilites from other planetary bodies such as the Earth, Moon and Mars.

Here, we have undertaken modelling to constrain the possible building blocks of the ureilite parent body (UPB), based on combinations of Fe- and Mg-rich chondrules and carbonaceous and other chondritic meteorites that are considered to be the building blocks of all terrestrial planetary bodies. We ran simulations trying to find matches consisting of three and two member combinations from various chondritic meteorite types that could simultaneously satisfy the oxygen isotope characteristics ($\Delta^{17}O$, $\delta^{17}O$ and $\delta^{18}O$) and elemental ratios (Mg/Si, Al/Si, Fe/Si, Fe/Al) from UPB compositions. Our preliminary results indicate that the bulk chemistry and oxygen isotope signatures of the UPB can be reproduced based on chondritic materials as possible building blocks but this leads to numerous non-unique solutions, which appear equally feasible.

[1] Lodders & Fegley (1997), *Icarus* **126** (2), 373-394 [2] Sanloup *et al* (1999) *Physics of the Earth and Planetary Interiors* **112**, 43–54 [3] Mittlefehldt *et al* (1998) *Mineralogical Society of America*. *Rev. Mineral*. **36**. p. 195.