

LETTER

**A unique glimpse into asteroidal melting processes in the early solar system from the Graves Nunatak 06128/06129 achondrites**

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ABSTRACT

The recently recovered Antarctic achondrites Graves Nunatak 06128 and 06129 are unique meteorites that represent high-temperature asteroidal processes in the early solar system never before identified in any other meteorite. They represent products of early planetesimal melting ( $4564.25 \pm 0.21$  Ma) and subsequent metamorphism of an unsampled geochemical reservoir from an asteroid that has characteristics similar to the brachinite parent body. This melting event is unlike those predicted by previous experimental or geochemical studies, and indicates either disequilibrium melting of chondritic material or melting of chondritic material under volatile-rich conditions.

**Keywords:** Achondrites, brachinites, planetesimal melting, asteroids, Al-Mg chronometer