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Chondrule formation and subsequent reprocessing by partial remelting in the protoplanetary disk.

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Chondrules from unequilibrated chondrites are among the oldest known solar system materials [1], are commonly considered to have preserved pristine chemical and isotopic signatures and thus provide unique constraints on the conditions that prevailed in the protoplanetary disk (PPD). In addition to the melt-formation that is associated with the chondrule forming process, some chondrules record evidence of high-T reprocessing prior to incorporation into their parent body, which is crucial to identify and study in order to interpret chondrule records (e.g. their ages) correctly. We present major, minor and trace element systematics of a unique type-I chondrule that allow to reconstruct its compex history from feldspar-controlled fractionation of mesostasis during primary formation to subsequent high-temperature reprocessing by partial dis-equilibrium remelting under reducing conditions. Combined with ^{26}Al-^{26}Mg ages of similar chondrules the results imply that multiple, distinct thermal pulses occurred in the chondrule forming region of the PPD throughout the time of chondrule formation.

[1] Pape, J. et al. (2019) GCA 54, 416–436.

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