Content English

Title: Extreme $^{54}$Cr-rich oxide grains in meteorites: Evidence for a single late supernova injection into the Solar System

Abstract text: Systematic variations in $^{54}$Cr/$^{52}$Cr ratios between different classes of meteorites point to large scale spatial and/or temporal isotopic heterogeneity in the solar protoplanetary disk. These variations have been attributed to nucleosynthetic effects, possibly carried by as-yet-unidentified presolar grains. We have recently identified extremely $^{54}$Cr-rich <200 nm oxide grains in the Orgueil meteorite, with estimated $^{54}$Cr/$^{52}$Cr ratios (after correcting for dilution by neighboring material on the sample mount) reaching more than 50 times the solar system value. The most likely source of these grains is the $^{16}$O-rich O/Ne and/or O/C zones of Type II supernovae. When combined with the unusual distribution of O isotopic compositions of other supernova-derived oxide grains, the variability in bulk $^{54}$Cr/$^{52}$Cr ratios between meteorite classes argues for a heterogeneous distribution of supernova grains, including the $^{54}$Cr carrier, injected directly into the solar protoplanetary disk from a single supernova.

Keywords: isotopic anomaly, meteorite, supernova, nucleosynthesis, presolar grains, chromium-54

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