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The origin of the dichotomy between carbonaceous and non-carbonaceous meteorites: Insights from Mo, Ru, and W isotopes

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Recent work has identified a nucleosynthetic isotope dichotomy between "carbonaceous" (CC) and "non-carbonaceous" (NC) meteorites [1,2]. By studying the relative isotopic characteristics of Mo, Ru, and W in iron meteorites, it is possible to constrain the processes leading to the distinct isotope heterogeneities in both reservoirs. In NC irons, isotope ratios of ε^{i}Mo and ε^{100}Ru are correlated, but ε^{i}Mo and ε^{183}W are not. In CC irons, ε^{i}Mo and ε^{100}Ru are not correlated, where ε^{i}Mo is variable and ε^{100}Ru is more restricted. By contrast, ε^{i}Mo and ε^{183}W are correlated in CC irons. This indicates that Mo, Ru, and W may be hosted in similar presolar carriers in both reservoirs. Thus, the contrasting behaviors of Ru and W relative to Mo in the two reservoirs likely require processing of the presolar carriers under distinct thermal and redox conditions. This provides further evidence that the NC and CC meteorites originated from spatially separated reservoirs that evolved under different prevailing conditions.

[1] Budde G. et al. (2016) EPSL 454, 293-303. [2] Kruijer T.S. et al. (2017) PNAS 114, 6712-6716.

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