Extrasolar Planetesimal Lithium Pollution of White Dwarfs as a Tracer of Galactic Lithium Evolution

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Tidal disruption and subsequent accretion of planetesimals by white dwarfs can reveal the elemental abundances of rocky bodies in exoplanetary systems. Those abundances provide information on the composition of the nebula from which the systems formed and the geological processes that the rocky material experienced, which is analogous to how meteorite abundances inform our understanding of the Solar System. We present the first identification of lithium and first identification of potassium in a white dwarf. We also present the second identification of lithium in a white dwarf. An additional three white dwarfs have since been discovered to be polluted by lithium from extrasolar planetesimals. All five white dwarfs' accreted extrasolar planetesimals have lithium levels higher than those of rocky material from the Solar System. We interpret the abundances of these five white dwarfs to demonstrate geological processes are not adequate to explain the lithium overabundances in all extrasolar planetesimals with lithium detections. The abundances and relative ages of the systems support the apparent lithium overabundances resulting from the initial nebular abundances. We compare our results to predictions for Galactic nucleosynthetic enrichment models and the Big Bang nucleosynthetic predictions for lithium.