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Planetesimal Compositions in Exoplanet Systems based on Host Star Composition

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We have used recent surveys of the stellar abundances of solid forming elements in a sample of exoplanet host stars discussed by Bond et al. (*Astrophys. J.* **715**, 1050-1070, 2010) to calculate the expected composition of silicate and ice planetesimals formed beyond the snow line in these systems. The refractory silicate and metal composition is derived following Johnson and Lunine (*Nature* **435**, 69-71, 2005) and Wong et al. (in *Oxygen in the Solar System* Vol. Reviews in Mineralogy and Geochemistry Vol. 68 (ed G. J. MacPherson) Ch. 10, 241-246, 2008). The nebula gas C and O composition was set based on amount of O tied up in refractories and the volatile condensation sequence for ices in the 5-10 AU region of the stellar systems calculated following Mousis et al. (*Astrophys. J.* **727**, 7pp, 2011). The resultant condensate compositions show that planetesimal compositions in exoplanet systems may differ significantly from solar system planet forming materials.

The C/O abundance of the exoplanet host star has the strongest effect on planetesimal composition, strongly affecting the relative proportions of refractory materials and volatile ices, particularly water ice and C-bearing ices. For stars with sub-solar C/O values H_2O and silicate plus metal dominate the condensate composition with CO_2 as the next most abundant species at $< \sim 0.10$ mass fraction. Minor species (CH_3OH, H_2S, NH_3, CH_4, PH_3), with mass fractions of $10^{-4}$to 10^{-2}, are present in approximately the relative proportions as for the solar nebula. As stellar C/O increases, H_2O decreases and beyond the solar value ([C/O] =0, C/O = 0.55), rapidly disappears as the C/O = $\sim$0.8 is approached, with CO_2 and CH_3OH ices becoming more important. Planetesimals in these systems will have refractory, silicate plus metal rich compositions compared with solar system conditions. If the midplane temperatures in the circumstellar nebula are $<\sim$20K the remaining CO and N_2 will condense as pure ice, further increasing the volatile ice proportions. These compositional variations will be significant for both icy bodies such as icy satellites of giant planets and the equivalent of Kuiper belt objects in these systems.

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