

## Chemistry of Impact-Generated Disks: Implications for the Moon

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In the giant impact theory for lunar formation, a significant portion of the Moon may accrete from a circumterrestrial silicate melt+vapor debris disk produced by the impact [1]. Physical and chemical processes operating in the disk are therefore expected to play a critical role in producing the observed chemical and isotopic abundance patterns in the Moon, which in turn provide constraints on lunar formation scenarios. For example, the Moon shares a number of compositional similarities with the bulk silicate Earth (including nearly identical  $\Delta^{17}\text{O}$  values [2]), but also displays depletions in moderately volatile elements such as K, Na, and Zn [e.g., 3] and enrichments in heavy Zn isotopes [4].

In a previous study [5] we combined a chemical model for a two-phase melt+vapor disk [6] with lunar accretion simulations [7] and a thermal evolution model [8] in order to explore the chemistry of the accreting lunar material and implications for the bulk lunar composition. The results of this coupled model indicate that the moderately volatile elements K, Na, and Zn condense relatively late in the disk's evolution, when most inner disk material is scattered and preferentially accreted by the Earth instead of the Moon. This process could thus produce depletions in lunar material (relative to the Earth) as a byproduct of lunar accretion, even in the absence of thermal escape from the disk.

Here we review the chemistry of impact-generated silicate melt+vapor disks - including speciation and the distribution of elements between melt and vapor phases - and explore the effects of fractionation processes influencing the composition and chemical evolution of the early Moon.

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