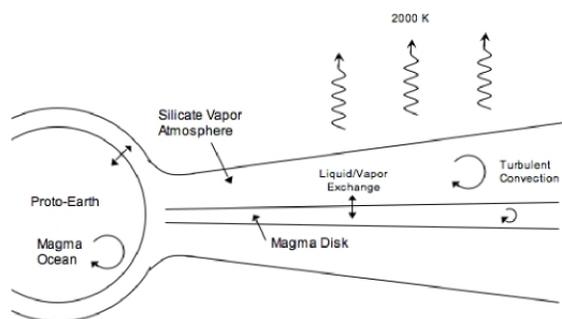


Equilibration of the Earth-Moon system following the giant impact

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The energy released in the Moon-forming giant impact is sufficient to melt and partially vaporize both the Earth and the impactor. The timescale to eliminate this heat by radiation is $\sim 10^3$ years. Hence, the Earth and protolunar disk are expected to be molten and enveloped by a convecting silicate vapor atmosphere for the first thousand years following the giant impact.



To explain the striking similarity of the oxygen isotopic composition of the Earth and Moon [1], we have previously proposed that the terrestrial magma ocean and the protolunar magma disk underwent equilibration in the aftermath of the giant impact through exchange with the common silicate vapor atmosphere [2]. Recent support for this idea comes from precise measurements of silicon isotopes that reveal the Moon to have a composition similar to the silicate Earth, a property not shared with Mars, Vesta, and chondrites [3].

Due to the liquid/vapor partitioning of the elements [4], such a model does *not* imply a chemical composition for the Moon that is identical with the silicate Earth. The ability of the vapor to exchange between the Earth and lunar disk, to undergo more vigorous turbulent motions than the liquid, and to preferentially escape in a hydrodynamic outflow will effect the chemical composition of the resulting Moon. We are presently undergoing an investigation of the consequences of the equilibration hypothesis to explore the extent to which this scenario can explain the similarities and differences in the Earth-Moon system.

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Precipitation and phase transformations involving ferric arsenate, scorodite and arsenical ferrihydrite

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Arsenic is a common contaminant in the effluents resulting from gold and base-metal processing and related extractive metallurgy operations. Conventional industrial practice of arsenic control and stabilization involves coprecipitation with ferric iron in a high-density sludge system as a ferric arsenate having molar Fe/As ratios of about 4 and greater. Ferric arsenate characterized by two broad humps on powder X-ray diffraction patterns has been reported from mine tailings, acid mine drainage precipitates, microbial mats at a geothermal spring and a sea-floor hydrothermal vent, and often referred to as the "amorphous" scorodite. Solubility studies have produced controversial results, with low to high solubility values which appear to have stemmed, in part, from the complexity of the ferric arsenate compounds that was not resolved by the characterization techniques employed. In order to provide insights into the nature of ferric arsenate and its relations to scorodite and ferrihydrite, a series of synthesis experiments were carried out at 70°C and pH values ranging from 1 to 4.5. The precipitates were characterized by high-resolution transmission electron microscopy, X-ray diffraction and X-ray absorption fine structure spectroscopy techniques. Experimental results including the nature of ferric arsenate and arsenical ferrihydrites having a wide range of arsenic concentrations, phase transformations and crystallization kinetics will be presented.