

## New developments in planetary formation theory of solar system derived from ABEL model

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The Earth was formed as dry rocky planet without atmosphere nor ocean at 45.6Ga. Atmospheric and oceanic components were added at 4.4Ga by late heavy bombardment. This 2 step formation model of the Earth is named ABEL model (Advent of Bio-Elements Landing Model). The origin of solid Earth is enstatite chondrite which has been already clearly indicated by analysis of oxygen isotopic composition and other isotopic data. At the same time, the origin of water on the Earth is carbonaceous chondrites which is backed by hydrogen isotopic ratio. These 2 facts have been thought to be contradictory, but ABEL model is able to explain them perfectly. Also this model explains this two-step formation was the precursor of the reaction as metabolism.

Here, we give a comprehensive views for the research of planetary formation theory of solar system based on ABEL model for followings. (1) Moon formation theory (Giant Impact model), (2) Chemical zoning of asteroid belt with observational facts (they does not support the Grand Tack model that suggests random distribution of chemistry), (3) Chronology research based on meteorites, (4) H<sub>2</sub> gas escaped during first 3 hundred million years after the formation of protoplanetary disk.

Based on above information, we give new developments in planetary formation theory of solar system.

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