New predictive model for composition of inner planets

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Analysis of available material of the Earth's crust, of samples from Moon, meteorites and Sun's photosphere show the correlation of relative abundances of elements with their first ionization potential [1]. This suggests that chemical differentiation in the Solar system was driven by the magnetic field of the protosun, which induced a magnetic separation of the ionized solar nebula matter. Our recent re-examination of this idea confirmed and expanded it [2]. In particular, we show that the deviations from the observed correlation are chemically and geochemically consistent, what conveys crucial information on the partition of elements between the surface and inner parts of planets.

Taking the trend of this correlation it is possible to calculate initial bulk mass fractions of elements for Earth.

• The results show very high initial content in hydrogen, making it first element in mole fraction.

• Assuming that unbonded hydrogen may have escaped Earth's gravitation, the remaining part may have contained up to 5.1 wt %, most of which should have been chemically stored in form of hydrides. Indeed, hydrides are proposed as suitable candidates to resolve Earth's core density problem [3].

• This theory predicts a quasi anoxic Earth, contradicting the generally admitted «chondritic model», which is now criticized. However, the new model is compatible with available geophysical data for the Earth interior (PREM).

• Progressive decomposition of hydrides may sustain the hydrogen flow beihg observed on the Earth's surface [4].

This topic requires closer attention of the scientific community.

1. Larin VN. Hydridic Earth: The New Geology of Our Primordially Hydrogen-Rich Planet. (Hunt CW, ed.). 1993, Alberta: Polar publishing.

2. Toulhoat H, Beaumont V, Zgonnik V, Larin NV., Larin VN. Chemical differentiation of planets: a core issue. Submitted. Available at http://arxiv.org/abs/1208.2909v2

3. Iizuka-Oku, R. et al., Nature Communications, 2017, 8, 14096.

4. See in this book of abstracts: "Hydrogen flow associated with shallow circular depressions".