erosion of Mercury silicate shell during its accumulation. G. V. Pechrnikova and A. V. Vitjazev, O. Yu. Schmidt Institute of Physics of the Earth, USSR Academy of Sciences, Moscow, USSR.

The composition of the terrestrial planets is an intriguing problem of planetary cosmogony and comparative planetology. We present the results of our calculations [1] within the framework of the model terrestrial planet formation, taking into account early differentiation of the primitive planetary interiors. In this model we can explain the planetary variations of Fe/Si even in the assumption quasi-homogeneous distribution of this quantity in preplanetary disk up to stage of the small bodies formation.

This model describes: (1) the growth of the planet's masses during the accumulation of the preplanetary bodies, (2) the increase of the planetesimals' relative velocities, (3) the widening of feeding zones of planets, (4) the impact heating of the growing planets, (5) the creation of the melting zones, (6) the differentiation iron and silicates, (7) ejection of matter of the planet to heliocentric orbits by high velocity impacts of the large bodies, (8) the exchange of the matter and the redistribution of angular momentum in overlapping feeding zones of the planets. This model can explain simultaneously the Mercury's enrichment in iron, a small silicate excess (~1-2%) on Venus as compared to the Earth as well as the relative masses of the planets and irregularities in their relative distances.

The growth of the masses of Mercury (a) and Venus (b) calculated according to [2], average relative velocity of preplanetary bodies $V_{\text{rel}}$ in feeding zone of Venus (c) and the escape velocity $V_{\infty}$ from the Mercury's surface (d) during the accumulation process are given in Fig. 1. The calculations show that during the accumulation process of the planets the moment $t$ when Venus begins to outstrip Mercury on mass, is sure to come. The average eccentricity $e$ of orbits of the bodies forming the planets reaches the value $e \approx 0.1-0.2$ by then. Corresponding relative velocities of the bodies in Mercury zone are $V_{\text{rel}} \approx V_{\infty} \approx \pm 4.9 \text{ km/c}$, i.e. they have the same values and even more than escape velocity $V_{\infty}$ from the surface of present Mercury ($V_{\infty} \approx 4 \text{ km/c}$). The situation is the same that in asteroids' zone - the accumulation process is changed by the erosion. The impact energy proves enough for the partial ejection of the matter from the surface layers of Mercury to the heliocentric orbits. The estimates show that the mass of the ejected matter is approximately twice as much the mass $m_o$ of the body-projectile, having velocity $\sim 10 \text{ km/c}$ before the encounter with the planet (we supposed that $\sim 10\%$ of the impact energy is converted into kinetic energy). The matter ejected from the Mercurian influence sphere is absorbed in part by Venus, some part of it falls on the Sun. The calculations show, that when the eject of matter on the Sun proves large enough, due to the conservation of angular momentum Mercury moves slightly to the Sun and Venus.
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outwards.

The most part of the impact energy (~0.9) is converted into heat. In collisions with above velocities the part of target material (up to several masses of the falling body) passes through melting. These estimates as well as other known data about the early heating of the Earth and the Moon indicate to the early beginning of the differentiation of the terrestrial planets already during their formation and to the early emergence of the shells, enriched in silicate and depleted in iron. In case of Mercury its silicate shell has been practically lost while Venus has received the small additional portion of the matter depleted in iron.

We have made the similar estimates for the ejection process of a matter from the Earth surface. The some part of the matter of the Earth primitive silicate mantle is captured by a presatellite swarm during the ejection, the some part of this material is accumulated by the swarm from gелиocentric orbits. As Pechernikova and Maeva [3] noted in such model we can explain many cosmochemical data including the depletion of the Moon in iron, taking into account the fractionation of the matter in the prelunar swarm.

The process of exchange of the matter between bodies in the Solar System, on that SNC, ALHA 81 005 and some others indicate, was apparently much more intensive in the past.