# Redox state of the terrestrial planets, new insights into their parental links with chondrites

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The inherited redox state of the terrestrial planets results from the chemical composition of building blocks, and internal chemical processes such as core-mantle segregation. Based on a large experimental data set of metal-silicate equilibria, we refine empirical relations between the experimental conditions (P, T and the sample composition) and the final iron oxide (FeO) concentrations of silicate melts equilibrated with liquid Fe-alloys. This empirical model is then used to calculate the final FeO concentrations in planetary mantles, for different compositions of the building blocks. We show that significant amount of FeO can enter the mantles of the relatively large planetary bodies (Earth, Venus and Mars) even if the building blocks are initially reduced, due to higher pressures and temperatures of metal-silicate equilibration with increasing the planetary size. Still, the progressive increase of FeO-content of terrestrial planets and asteroids with distance from the Sun must be related to the accretion of chondrites formed at increasing oxygen fugacity: Bencubbine or enstatite chondrites for Mercury, enstatite chondrites plus 30% to 50% of carbonaceous or ordinary chondrites for Earth and Venus, H or L ordinary chondrites for Mars and carbonaceous chondrites for Vesta. This redox gradient in the proto-planetary disk is in agreement with the radial decrease of the planetary core/mantle mass ratios and with the correspondences between planetary and chondritic Fe/Si ratios and isotopic compositions [1].

[1] Warren P. H., *EPSL,* **311**, 93-100 (2011).