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Edgar Sikko Steenstra



# Constraints on Planetary Formation, Accretion and Differentiation from Experimental Petrology

Constraints on Planetary Formation, Accretion and Differentiation from Experimental Petrology

Edgar Sikko Steenstra



## Constraints on Planetary Formation, Accretion and Differentiation from Experimental Petrology

Core formation and segregation of sulfide liquids profoundly affect the chemical composition of planetary mantles. These processes are therefore important for investigation of planet formation and evolutionary processes. The author presents a number of detailed high pressure-temperature experimental studies of metal-silicate and sulfide-silicate partition coefficients for major and minor elements. The author combines these results with newly derived mantle abundances of these elements to provide new constraints on the pressure and temperature during differentiation of Mercury, Mars, the Moon and various asteroids, as well as on their core compositions. These results show that magma oceans likely occurred on most if not all terrestrial bodies in their early evolution. Finally, the author demonstrates that many volatile elements can partition into their cores, providing new insights into planetary volatile element depletion systematics.