Melting Temperature of Tagish Lake (CI2) meteorite from 5 to 30 GPa

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Magma ocean is an inevitable stage of terrestrial planets formation where silicate and metals are melted together during accretionary processes [1]. Knowledge of the melting temperature and phase relations of chondrite-like materials at high pressure are, therefore, an important step to understand early planetary differentiation such as the core formation as well as bulk composition and redox state of the mantle in terrestrial planets. The bulk composition of the Earth has long been debated to result from the accretion of chondrites; to date, however, there is no firm conclusion about the origin and composition of the Earth's building blocks [2,3].

Among other candidates (e.g. enstatite chondrites, ordinary chondrites, achondrites), carbonaceous chondrites (CC) are interesting because their composition is close to that of the bulk silicate Earth (BSE) while they contain larger quantities of volatiles and high oxidation state in contrast to the more reduced enstatite chondrite models. Natural CCs are, therefore, valid analogue starting materials to investigate the formation of Earth-like planets under high oxygen fugacity conditions and infer the effect of volatiles on planetary differentiation processes.

We performed experiments at 5, 12, 21, 25 and 30 GPa, and temperatures between 1400 and 1900 °C using multi anvil apparatus. Sample consisted of a finely powdered natural CC from Tagish Lake (Ontario, Canada) packed into a graphite capsule. After HP experiments, samples were recovered to atmospheric conditions and polished for textural and chemical characterization of the mineral phases using FE-SEM and electron microprobe on accurately polished surfaces. Preliminary results show the effect of volatile on the melting temperature of Tagish Lake (CI2) with respect to Allende (CV3) meteorite, enstatite chondrite and KLB1, respectively. Results on the phase equilibria are used to derive a model of accretion and possible core segregation that takes into consideration the possible stability of carbon and hydrous species along with a Fe-Ni sulfide melt. Possible implications for the evolution of the mantle redox state will be also discussed.

[1] Elkins-Tanton (2012) *Annu. Rev. Earth Planet. Sci.* **40**, 113-139. [2] Agee (1990) *Nature* **346**, 834-837. [3] Javoy et al. (2010) *Earth Planet. Sci. Lett.* **293**, 259-268.