^{207}Pb-^{206}Pb dating of phosphates in CK chondrites; did their parent body have "onion-shell" structure?

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Among several types of carbonaceous chondrites, CK group is known as the only group whose petrologic types vary from 3 to 6 (or probably, to 7 [1]). Revealing thermal history of CK chondrites is important for the better understanding of the evolution history of carbonaceous chondrites. The parent body of CK chondrites is suggested to have had a thermal "onion-shell" structure (e.g. [2]), but thermal history of the parent body of CK chondrites remains still unknown. One of the effective ways to obtain information on the thermal structure of the parent body is measuring the metamorphic ages and connecting them with the cooling history of the parent body. Trieloff et al. [3] compared the results of several dating methods including ^{207}Pb-^{206}Pb dating on apatite grains for H chondrites with various thermal metamorphic stages, and advocated that the parent body of H chondrites had a thermal "onion-shell" structure. The same methods can be applied to CK chondrites in this study.

Calcium phosphates (apatite [$Ca_5(PO_4)_3(F,Cl,OH)$] and merrillite [$Ca_7NaMg(PO_4)_9$]) are suitable minerals for ^{207}Pb-^{206}Pb dating of meteorites. There is a previous study that conducted Pb-Pb dating of phosphates in a meteorite NWA 8186, which was originally classified as an ungrouped achondrite but is proposed to be classified as a "CK7" chondrite [1], but not yet for less thermally metamorphosed CK chondrites (CK3-6). Thus, it is also still unknown whether the variations in ^{207}Pb-^{206}Pb ages of phosphate grains in CK chondrites exist or not. Therefore, we have conducted the ^{207}Pb-^{206}Pb dating on phosphate grains in CK chondrites with various thermal metamorphic stages using NanoSIMS 50 [4], and discussed thermal history of their parent body.

[1] Srinivasan et al. (2017) 48th LPSC, Abstract #1995. [2] Greenwood et al. (2010) *GCA* **74**, 1684-1705. [3] Trieloff et al. (2003) *Nature* **422**, 502-506. [4] Koike et al. (2014) *Geochem. J.* **48**, 423-431.