OVERGROWTH LAYERS ON PYROXENE IN AN FeO-RICH PORPHYRITIC CHONDRULE IN CO3.0 Y-81020.

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Back-scattered electron (BSE) images of numerous high-FeO pyroxene-rich (px) porphyritic chondrules in LL3.0 Semarkona show low-Ca px phenocrysts containing 4-8 dark/bright sets of overgrowth layers [1,2]; these layers provide evidence of multiple melting events [2,3]. A primary event caused extensive melting (perhaps >40%) and produced the chondrules' spheroidal shapes due to surface tension. There were several secondary heating events, each of which caused minor amounts of melting (roughly 5%). Crystallization of low-Ca pyroxene caused the adjacent mesostasis to become enriched in FeO; the overgrowth layer gradually became more ferroan (and BSE bright). During the next heating episode, the relatively FeO-rich, low-melting fraction of the mesostasis next to the px grain (together with some more-magnesian mesostasis) melted. The next px overgrowth layer had lower FeO than the immediately underlying BSE-bright layer, but generally higher FeO than the preceding BSE-dark layer. This process was repeated, producing sets of dark/bright layers and an overall trend toward higher FeO. Compositional zoning profiles across the overgrowth layers thus achieved a "sawtooth" pattern.

We report sets of BSE dark/bright overgrowths on low-Ca px phenocrysts adjacent to an olivine (ol) grain in a POP chondrule (C6f) in CO3.0 Yamato 81020 section 61-6 (Fig. 1). Small low-Ca px (Fs_{38}) grains surround a large ol grain (Fa_{25-78}); also present is mesostasis with Ca-px crystallites. There are 3-4 5-10-µm-thick sets of dark/bright overgrowths in the px. We took two parallel traces across the overgrowth layers with the electron microprobe. The px overgrowth profiles are analogous to those in Semarkona [2,3]. The overgrowth layers exhibit a dark-to-bright compositional pattern: FeO varies from 19-25 wt.%; CaO varies from 0.8-1.7 wt.%. The pattern is most easily visible from the grain center toward the right edge. The BSE-dark layer near the grain center shows appreciably lower concentrations of FeO (21.9 wt.%), CaO (0.80 wt.%) and Cr_2O_3 (0.79 wt.%). It is flanked on the right by a BSE-bright zone enriched in FeO (23.6 wt.%) and CaO (1.3 wt.%). However, Cr_2O_3 (0.62 wt.%) is depleted, perhaps due to partitioning of Cr into nearby chromite. As the trace approaches the right edge of the grain, the concentrations of these three oxides increase. The ol grain in chondrule C6f exhibits P overgrowth patterns similar to those in Semarkona PO chondrules [4], consistent with multiple melting episodes (as also seen in a BPO Semarkona chondrule [5]).

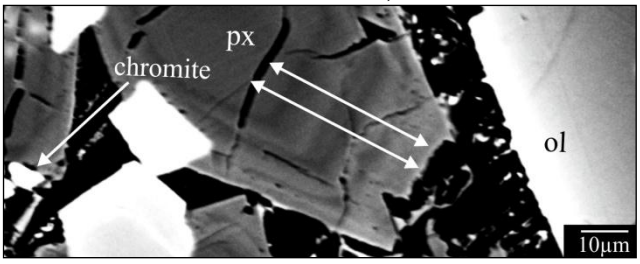

Fig. 1: Low-Ca px overgrowths in Y-81020 chondrule C6f. BSE.

References: [1] Jones R. H. 1996. *GCA* 60, 3115-3138. [2] Wasson J. T. et al. 2014. *LPS* 45, abstract#2883. [3] Baecker B. et al. 2015. *LPS* 46, abstract#2412. [4] Rubin A. E. et al. 2015. *MPS* 50, abstract#5033. [5] Baecker B. et al. 2015. *LPS* 46, abstract#2811.