Timing and variation in the composition of fluorapatite in the Amba Dongar carbonatite alkaline complex

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Apatite in the Amba Dongar carbonatite alkaline complex was dated using the U-Pb laser ablation ICPMS technique. Their origin is interpreted as primarily magmatic, from a magma which was rich in a CO_2-water fluid phase [1]. They occur as cumulates, disseminated grains and massive aggregates. Electron microprobe analyses of apatite show no characteristic excess REEs. At a detection limit of 0.1 to 0.01 wt%, total REE+Y concentration ranges from 0.30 to 0.63 wt%, and the HREEs are usually below detection limit in most samples. The apatite is high in Sr (~2.25 wt%) and an increase in REE concentrations correlates with increasing Si and decreasing Na. Earlier workers have dated biotite in the carbonatites, and these data have provided a strong link between the timing of carbonatite emplacement and Deccan volcanism [2]. Here we report U-Pb apatite ages from the carbonatites analysed in-situ with LA-ICP-MS. Using VizualAge_UcomPbine data reduction scheme for Iolite [3], pristine sövites with low U (~4 ppm) yielded U-Pb Tera-Wasserburg concordia lower intercept ages of 62 ± 22 Ma (MSWD = 2.6, $^{207}Pb/^{206}Pb_i$ = 0.831) and 63 ± 19 Ma (MSWD = 1.0, $^{207}Pb/^{206}Pb_i$ = 0.833). Metasomatised sövite with a higher U concentration (14-100 ppm) yielded a more precise age of 62.3 ± 1.6 Ma (MSWD = 0.70, $^{207}Pb/^{206}Pb_i$ = 0.802). Assuming all the apatites are cogenetic, a combined U-Pb TW plot of all data yields an age of 65.4 ± 2.5 Ma (MSWD=2.8), agreeing with previously reported Ar-Ar ages [2]. Given the potential overlap in age with the Deccan plume, more precise (i.e. ID-TIMS U-Pb apatite) age constraints would be beneficial to constrain the timing of carbonatite magmatism.

[1] Deans *et al*. (1972) *TIMM 81*, B1-B9. [2] Ray & Pande (1999). *GRL 26*(13), 1917–1920. [3] Chew *et al*. (2014) *Chem Geol 363*, 185–199.