Variations in H_2O content and H_2O/Ce ratio of mantle pyroxenites: implications for enriched components in the mantle

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Mantle pyroxenite xenoliths were collected from Hannuoba, East China and investigated for their H_2O content and trace element contents, with particular regard to H_2O/Ce ratio. The pyroxenites are divided into three groups: Cr-pyroxenites, Al-pyroxenites, and Garnet-pyroxenites. The pyroxenites show a range of H_2O content and H_2O/Ce ratios much wider than those previously reported on pyroxenites. The Cr-pyroxenites show a H_2O range from 23 to 339 ppm and a H_2O/Ce ratio between 32 and 212, Al-pyroxenites a H_2O range from 42 to 106 ppm and a H_2O/Ce ratio between 1 and 22 and Garnet pyroxenites a H_2O range from 37 to 69 ppm and a H_2O/Ce ratios between 5 and 54. These systematic variations of H_2O and H_2O/Ce ratio for Hannuoba pyroxenites are linked with their origins. The Cr-pyroxenites are fractionated in small fractures, in vein or conduit surrounded by peridotite wall-rock. The dramatic decrease of both H_2O and H_2O/Ce toward to the values of Hannuoba peridotites may due to the fast diffusion of H_2O to peridotites. The Al-pyroxenites are fractionated in large hydraulic fractures or magma chambers. The fractional crystallization processes bring constant H_2O/Ce ratio and negative correlation between H_2O and Mg# of cpx. The Garnet pyroxenites are high pressure cumulates and may be buffered by the surrounding peridotite wall rock. Both H_2O content and H_2O/Ce ratio of the Al-pyroxenites are low, compared to Hawaiian pyroxenites, Enriched Mantle, and Depleted MORB Mantle source. The high H_2O content and H_2O/Ce of the melt equilibrated with the Cr-pyroxenites require that a water-rich component was involved. Their large variation may indicate that Cr-pyroxenites could be an essential ingredient in the source of basalts from North China Craton.