# Petrogenesis of Early Cretaceous high-MgO diorites and granitoids in the Rangnim Massif, North Korea: Implications for tectonic setting of magmatism and gold mineralization

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A large scale of gold deposit-hosted intrusive rocks are distributed in North Korea. A combination of major and trace element, whole-rock Sr-Nd-Hf isotope and zircon U-Pb-Hf-O isotope data are reported for the Early Cretaceous granitoids from the Rangnim Massif, North Korea, in order to constrain their sources, petrogenesis and tectonic setting. The intrusive rocks mainly consist of high-MgO diorites to granodiorites and porphyric granites. Zircon SIMS U-Pb dating gives coeval emplacement ages of 111-112 Ma for the magmatism. The high-MgO diorites and granodiorites have high MgO (up to 4.8 wt.%) at intermediate $SiO_2$ contents, indicating a mantle source. They have high initial $^{87}Sr/^{86}Sr$ rations and negative $\varepsilon_{Nd}(t)$ and $\varepsilon_{Hf}(t)$ values, suggesting that the mantle source had been metasomatized by continental crustal materials for a long term or by ancient crustal materials before magma generation. However, the coupling whole rock Nd and Hf isotopes and high $\delta^{18}O$ values of the high-MgO diorites argue for the later. The high-MgO diorites and granites have variable major and trace elements and whole rock Sr-Nd-Hf isotopes. The well relationship between $SiO_2$ (or MgO) and Sr, Nd or Hf isotopes suggest that the Ealy Cretaceous high-MgO diorites to granodiorites and granites were the result of pyroxene- and amphibole-dominated crystal fractionation of mafic magma, coupled with extensive crustal assimilation. Importantly, the identification of ancient continental crustal materials in the mantle reveals a lithospheric delamination event in North Korea before or at the timing of magma generation. Therefore, our new data suggest that the Early Cretaceous magmatism of Rangrim Massif is generated by AFC of enriched lithospheric mantle-derived magmas, and the magmatism and metallogenesis are the result of lithospheric delamination in North Korea during Early Cretaceous.