



## **The origin of the Songshugou ultramafic massif, Qinling orogenic belt: Constraints from mineral chemistry, O isotopes and Re-Os geochronology**

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The Songshugou ultramafic massif is located on the northern side of the Shangdan suture, Qinling orogen, marking the tectonic boundary between North China Block (NCB) from South China Block (SCB). The petrogenesis and formation age of the ultramafic massif are crucial to constrain the tectonic processes during the collision between NCB and SCB. In-situ oxygen isotope analysis of 311 spots on the olivine grains reveals the  $\delta^{18}\text{O}$  of olivine mainly fall in the range of 4.8-5.8‰ with an average value of  $5.36 \pm 0.29\text{‰}$  suggesting a mantle origin. Re-Os geochronology yields a maximum TRD age of 805 Ma, constraining the minimum formation age of the harzburgites. Mineral geochemistry, microstructure and O isotope indicate the dunites experienced boninitic melt-rock reactions, which lead to dissolution of pyroxene and precipitation of olivine. The timing of this reaction is estimated by the Re-Os isochron age of  $501 \pm 220$  Ma. Together with regional geology and previous study on the surrounding mafic rocks, the Songshugou ophiolite was remnant of Shangdan oceanic lithosphere initially formed in the mid-ocean ridge and then experienced melt-rock reactions in a SSZ setting.