

Supplementary Information A and B

A. Fig. S1 Hand-specimen photographs and typical BSE images of ilmenite GER16 and titanite MAD12.

Fig. S2 Scanning electron microscope images of ablation craters produced by ns-LA system. The LA parameters are the ablation frequency of 1 Hz, the energy density of 3.5 J cm^{-2} , and the spot size of $24 \mu\text{m}$.

Fig. S3 Scanning electron microscope images of ablation particles produced by ns-LA system. The LA parameters are the ablation frequency of 1 Hz, the energy density of 3.5 J cm^{-2} , and the spot size of $24 \mu\text{m}$.

Fig. S4 Typical ^{49}Ti signal intensities obtained by ns-LA-MC-ICP-MS under both dry and wet plasma conditions for Ti-rich minerals and Ti metal. The LA parameters are the ablation frequency of 1 Hz, the energy density of 3.5 J cm^{-2} , and the spot size of $24 \mu\text{m}$. Range bars represent the standard deviations of three analysis.

B. Table S1 Major and trace elements in ilmenite GER16 and titanite MAD12 were measured by LA-ICP-MS.