

## Miocene high-temperature magmatism in the Himalayan orogen

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Himalayan leucogranites are generally thought to be produced by partial melting of metasedimentary rocks at relatively low temperatures of <800 °C. Whether Cenozoic high-temperature (>800 °C) granites have been formed in the Himalayan orogen is poorly known. Here we used Ti-in-zircon thermometer combined with thermodynamically calibrated relationship of  $T-a_{\text{SiO}_2}-a_{\text{TiO}_2}$  to retrieve the crystallization temperature of the ca. 17 Ma two-mica granites from Yalaxiangbo. The maximum value of crystallization temperature (ca. 850 °C) provides a significant constraint on the partial melting temperature of the sources, which were suggested to be Na-rich metasedimentary rocks based on the Sr-Nd isotopic compositions and zircon U-Pb age spectrum. Furthermore, phase equilibrium modeling using the Na-rich metasedimentary rocks as the sources indicates that partial melts produced at  $T = 850$  °C and  $P = 6-10$  kbar can best match the target granites in major element compositions. Our results demonstrate that melting temperatures for the formation of Himalayan leucogranites probably have been underestimated in previous studies. Such high temperatures are difficult to be accounted for by radiogenic and frictional heating of the crust alone, but require an extra heat source, probably provided by the upwelling asthenosphere beneath the south Tibet.

**Keywords:** Himalaya; Leucogranites; High-temperature; Phase equilibrium modeling