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托云盆地新生代幔源岩浆源区起止深度的限定

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摘要:

在详细介绍了地幔熔融柱模型原理(Langmuir *et al.*, 1992)的基础上,基于平衡熔融和分离熔融模型分别计算获得了上地幔橄榄岩源区在不同初始压力条件下发生绝热减压部分熔融时熔体相中FeO-MgO和FeO-Na₂O成分的演化轨迹。依据深源岩石包体与托云玄武岩之间的寄主关系将本次研究的16件托云火山岩样品划分成Group-1(深源岩石包体寄主岩)和Group-2(非寄主岩)两群,将收集前人的40件样品依据是否测试获得FeO的质量百分含量划分成Group-3群(具有实测的FeO质量百分含量)和Group-4群(无实测FeO质量百分含量数据)。分别以上四群样品运用地幔熔融柱模型进行反演获得上地幔部分熔融源区的起止深度范围: Group-1和Group-3样品具有相同的初始熔融深度3.2km (34.1kbar),但它们的部分熔融作用终止深度分别为110.1km (33.1kbar)和88.4km (26.2kbar); Group-2样品数据所反演的岩浆起源的初始深度和终止深度分别为111.6km (33.6kbar)和84.3km (24.9kbar); Group-4样品反演所获得的岩浆源区的起止深度分别为121.7km (36.8kbar)和106.0km (31.8kbar)。依据实测FeO百分含量的样品群反演的结果,将托云火山岩部分熔融源区的深度限定在3.2 km至84.3km,即48.1Ma前托云盆地所处的岩石圈厚度为84.3km,对梁涛(2005)运用熔融柱模型反演的托云盆地岩石圈深度进行了校正。此外,由地幔熔融柱模型反演获得的托云火山岩部分熔融源区熔体的温度压力条件与基于玄武岩中高压巨晶所反演的岩浆演化温压轨迹有十分吻合的继承演化关系。地球物理探测表明现今西南天山岩石圈的厚度为71km,区域岩石圈演化历程中深度上13.3km的差异足以证明岩石圈拆沉这一地球动力学过程的存在,为由宽SHRIMP年龄谱识别出的岩石圈拆沉作用提供了另一个有力的证据。

英文摘要:

In this paper, the mantle melting column (Langmuir *et al.*, 1992) was introduced entirely. The trajectories unit paths of FeO-MgO and FeO-Na₂O in process of mantle sources adiabatically ascending and melting with different origin pressure condition have been calculated by employing two different melting function, equilibrium melting and fractional melting, respectively. According to the outcrop relationship between xenoliths and basalts, 16 basalts samples with analyzed FeO content in this study were divided into two groups, basalts in group-1 hosted the xenoliths, and group-2 samples without any xenoliths. Furthermore, major elements data of 40 basaltic samples collected from the published papers about Tuyon volcanic rocks were set into group-3 (with analyzed FeO content) and group-4 (without analyzed FeO content). The mantle melting columns of four groups were inversed, the original depth and final depth of partial melting for group-1 are 113.2km (34.1kbar) and 110.1km (33.1kbar), respectively. The melting ranges for Group-2 were limited from 111.6km (33.6kbar) to 84.3km (24.9kbar), and the original melting depth of Group-3 is 113.2km (34.1kbar) and 88.4km (26.2kbar) is for its final melting depth. The inversed depth range of melting column for group-4 samples from 121.7km (36.8kbar) to 106.0km (31.8kbar). In summary, the partial melting depth of Tuyon volcanic rocks is limited from 113.2km to 84.3km on the base of sample groups with actual FeO content and modified the melting depth inverses by Liang (2005), which shows the depth of regional lithosphere Tuyon basin located is 84.3km in 48.1Ma. The basal magma *P-T* condition inversed by mantle melting column matches well with the *P-T* path inversed by the information from megacryst hosted basalts. From the seismic data, the lithosphere thickness of Southwest Tian Shan is 71km, the thickness balance of 13.3km has proved the exist of lithosphere delamination in the history of Southwest Tian Shan lithosphere evolution identified firstly by wide spectrum of SHRIMP dating in Tuyon volcanic rocks.

关键词: [熔融柱](#) [托云火山岩](#) [源区深度](#) [岩石圈拆沉](#)