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南苏鲁芝麻房石榴石橄榄岩中橄榄石的“C”类组构及其形成条件探讨

[许志琴](#) [陈晶](#) [王勤](#) [曾令森](#) [杨经绥](#) [陈方远](#) [李天福](#) [梁凤华](#)

[1]中国地质科学院地质研究所国土资源部大陆动力学重点实验室, 北京100037 [2]北京大学物理系, 北京100871 [3]南京大学地球科学系, 南京210093

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摘要:

上地幔地震的各向异性主要归因于橄榄石的优选方位, 不同的橄榄石优选方位模式可以作为上地幔不同动力学作用的指示剂。不同应力和含水量条件下的高温变形实验已经确定出五类橄榄石组构模式(“A”型、“B”型、“C”型、“D”型和“E”型)。本运用电子背散射(EBSD)技术对来自苏鲁超高压变质带南部的芝麻房石榴石橄榄岩的橄榄石进行了优选方位测定, 不同变形程度的橄榄石均显示了[100]轴近垂直于面理和[001]轴近平行于线理的特征, 为“C”类组构模式, 可见组构类型与变形程度没有关系, 并且橄榄石组构所显示的NW向SE的剪切指向, 与围岩正、副片麻岩中形成于折返过程的石英优选方位所显示的SE向NW的剪切指向完全不同, 说明芝麻房石榴石橄榄岩中橄榄石的“C”类组构是折返前形成的。结合橄榄石结构水的测量和已有的芝麻房石榴石橄榄岩形成的温压条件, 推测该组构形成于含水俯冲带中, 认为芝麻房石榴石橄榄岩的原岩来自于高含水的上部地幔楔碎块, 与俯冲的陆壳物质一起经历了超高压变质作用并最终折返至地表。

英文摘要:

Upper mantle seismic anisotropy is mainly attributed to the lattice-preferred orientation (LPO) of olivine, which is regarded as an indicator of different dynamic processes. Five types of olivine fabric have been identified for olivine aggregates in simple shear deformation experiments under various water contents and stresses. Using the electron backscatter diffraction (EBSD) technique, we measured the LPOs of olivine porphyroclasts in the Zhimafang garnet peridotite of the southern Sulu ultrahigh-pressure metamorphic terrane. Although these olivine grains have experienced different degrees of deformation, all of them have distinctive type-C fabric in which [100] axes is concentrated subnormal to the foliation and [001] axes subparallel to the lineation. Our data do not show any correlation between the types of olivine fabric and degrees of deformation. This observation together with the differences in the shear direction inferred from olivine fabric from that from quartz fabric formed during exhumation demonstrate that the type-C olivine fabric did not result from deformation associated with the exhumation phases of the Sulu UHP rocks. In stead, the type-C olivine fabric was formed in a subduction zone under high water activity, as suggested by water contents of olivine crystals and the temperature and pressure conditions of the Zhimafang garnet peridotite. These results suggest that during subduction of the Yangtze plate, the Zhimafang garnet peridotite was captured from the overlying mantle wedge and then experienced ultrahigh-pressure metamorphism as the Yangtze continental block was subducted to mantle depths.

关键词: [橄榄石](#) [优选方位](#) [俯冲带](#) [超高压变质作用](#) [苏鲁地区](#)

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主办单位: 中国矿物岩石地球化学学会

单位地址: 北京9825信箱/北京朝阳区北土城西路19号

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[linezing@163.com](#)