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Deformation microstructures of spinel peridotite xenoliths from the Rio Grande rift, New Mexico

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Spinel peridotite xenoliths from Rio Grande rift, New Mexico, were studied to understand the deformation processes related to the fractional melting in the upper mantle. Lattice preferred orientation (LPO) of olivine was determined using electron backscattered diffraction (EBSD) with the Channel 5 software. Water content of olivine was measured using the Nicolet 6700 FTIR with Continuum FTIR Microscope. Sampling locations are divided into three regions: Kilbourne Hole (KB, sample 471 – 473), Elephant Butte (EBBM, 468, 474), and Adam's Diggings (ADTM, 475 – 479). The rate of fractional melting of samples is up to 16% (protogranular textured xenoliths from KB), 2 – 5% (porphyroclastic textured xenoliths from KB and EBBM), and 7 – 14% (porphyroclastic textured xenoliths from ADTM). Ten samples showed various types of LPOs of olivine. Four samples (468, 473 – 475) showed a type–A LPO, which is characterized as olivine [100] axes aligned subparallel to the lineation and [010] axes normal to the foliation. Two samples (476, 478) showed a type–C LPO, which is characterized as olivine [001] axes aligned subparallel to the lineation and [100] axes normal to the foliation. Two samples (471, 472) showed a fabric, which is characterized as both olivine [100] and [001] axes distributed in a girdle nearly subparallel to the lineation and [010] axis normal to the foliation. The other samples (477, 479) showed a fabric, which is characterized as both olivine [010] and [001] axes distributed in a girdle nearly subparallel to the lineation and [100] axis normal to the foliation. FTIR study of specimens showed that O-H peaks were not observed in all samples. This result suggests that the hydrogen in olivine was diffused out during fractional melting after samples showing type–C LPO were deformed in a wet condition, while samples showing type–A LPO were deformed in a dry condition.