

Phase transforms of aluminous phases

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The phase relations in NaAlSiO_4 and $\text{NaMgAl}_3\text{SiO}_8$ have been investigated by in situ X-ray diffraction measurements using laser heated diamond anvil cell up to 165 GPa and 80 GPa, respectively. NaAlSiO_4 transforms to CaFe_2O_4 -type structure at ~ 25 GPa, and the latter phase was found to be stable to 165 GPa. On the other hand, $\text{NaMgAl}_3\text{SiO}_8$ crystallize into NAL phase (hexagonal phase) above 15 GPa which breaks down into two solid solutions with CaFe_2O_4 -type structured phase and NAL phase at ~ 30 GPa. The proportion of CaFe_2O_4 -type structured phase increases with increasing pressure. NAL phase was found to be stable even at 80 GPa, and coexists with CaFe_2O_4 -type structure. This suggests that the extinction of NAL phase in aluminous phase in MORB composition at 40-50 GPa attributes to the transformation to CaFe_2O_4 -type structure.