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TEM observation of disproportionation of mullite and sillimanite under shock compression TOSHIYUKI ATOU, NOBUAKI KAWAI, KAZUTAKA G. KAKAMURA, KEN-ICHI KONDO, Materials and Structures Laboratory, Tokyo Institute of Technology, MASAE KIKUCHI, Kansei-Fukushi Laboratory, Tohoku Fukushi University, SHUN ITO, KUNIO YUBUTA, Institute for Materials Research, Tohoku University — The aluminum silicates, mullite and sillimanite are fundamental raw minerals for the refractory industry and ceramics. Shock compression curves of these materials indicate phase transitions above about 30 GPa. Large volume decrease accompanied with the phase transitions have been attributed to disproportionation to alumina and silica. However, detailed behavior of the disproportionation has not been well understood yet. Using transmission electron microscopy, we confirmed very fine (less than 10nm) γ -alumina in mullite specimen shock-loaded to 65 GPa. In sillimanite specimen shock-loaded to 54 GPa, γ -alumina was also observed, but the particle sizes were much larger (10-20 nm) than those in mullite specimen, suggesting that the disproportionation in sillimanite specimen occurred at lower shock pressure than in mullite specimen. Furthermore, characteristic nano texture observed in mullite specimen could not found in sillimanite specimen, which might be caused by difference in crystal structures between mullite and sillimanite.

Toshiyuki Atou
Materials and Structures Laboratory, Tokyo Institute of Technology

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