Abstract Submitted
for the SHOCK05 Meeting of
The American Physical Society

The amorphization and disproportionation of Mullite ($3Al_2O_3$ $2SiO_2$) under shock compression NOBUAKI KAWAI, KAZUTAKA NAKAMURA, KEN-ICHI KONDO, Materials and Structures Laboratory, Tokyo Institute of Technology, TOSHIYUKI ATOU, SHUN ITO, KUNIO YUBUTA, Institute for Materials Research, Tohoku University, MASAE KIKUCHI, Kansei Fukushi Research Center, Tohoku Fukushi University — Shock-recovery experiments have been performed on mullite ($3Al_2O_3$ $2SiO_2$) polycrystals in the pressure range up to 65 GPa. The recovered samples have been examined by using XRD method and TEM observation. In the samples shocked at 40 and 49 GPa, an amorphization of mullite occurs. Mullite nanocrystals (<10 nm) are dispersed in an amorphous phase. The direction of crystal axis of these nanocrystals seems to be preserved to that of the starting sample, indicating that the relatively large starting mullite crystal ($\sim$10 μm) break into nanocrystals accompanied with the amorphization. In contrast, at 65 GPa, the mullite decomposes into amorphous SiO_2 and γ-Al_2O_3. Very fine γ-Al_2O_3 particles less than 10 nm are observed in the matrix of the amorphous SiO_2. The electron diffraction reveals that the γ-Al_2O_3 crystals are randomly oriented, suggesting that a rapid disproportionation reaction of mullite have been induced.

Nobuaki Kawai
Materials and Structures Laboratory, Tokyo Institute of Technology

Date submitted: 06 Apr 2005 Electronic form version 1.4