Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SMP044-P08 Room:Convention Hall Time:May 25 14:00-16:30

Microstructure in mullitization from sillimanite

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Transmission electron microscope (TEM) experiments were carried out of sillimanite which was heated in various conditions. The sample taken as starting material was sillimanite crystal in Rudvagshetta, Lutzow-Holm, Antarctica. This starting crystal has no microstructure and l=odd reflections in electron diffractio pattern.

Sample which was heated at 1470C for 1150 hours had two domains by TEM observation; in one domain the reflections with l=odd which is characteristic of sillimanite were obtained in the diffraction pattern, and in another those were not obtained. This In the domain with l=odd reflections, anti-phase boundary (APB) like structure was obaserved. And furthermore, both domains had SiO2-rich glass inclusions. These relusts indicate that sillimanite decompose to mullite and SiO2-rich melt/SiO2-rich amorphous at high temperature. And sillimanite change to disordered sillimanite with mullite components at high temperature and then APB-like structure occures at cooling time.

Keywords: sillimanite, mullite, microstructure