INTRODUCTION
Mineralogical and geochemical study on Virtasalmi kaolin occurrences includes three objectives.
1) To determine the abundance and distribution of REE in the studied kaolin profiles.
2) To address the factors controlling the distribution pattern and behaviour of REE during kaolinization process.
3) To find out the potential of Virtasalmi kaolins for ionic adsorption type REE-deposits. The samples for mineralogical and chemical studies were selected from the drill cores of the Litmanen, Eteläkylä, Vuorijoki and Montola deposits. The detailed description of these deposits has been presented by Sarapää (1996).

MINERALOGY
The main minerals are kaolinite, quartz, with minor amounts of illite. Micro-analysis of studied kaolin samples revealed the occurrences of euhedral to subhedral (typically; 20 µm in length and 5 µm in diameter) micro-size crystals of resistant heavy mineral in the kaolins, chiefly Ce-monazite, Th-bearing monazite, and xenotime. The microanalysis of the monazite grains reporting the following composition: 38% - 70% LREE, 5% - 7% CaO and 25% - 55% P₂O₅.

SUMMARY
1. Two factors cause the REE concentration in Virtasalmi kaolins: (1) REE enrichment, 50-85% related to ionic adsorption from solution onto kaolinite and halloysite minerals during weathering process. (2) The residual REE-bearing minerals, such as monazite and zircon, derived from parent rocks were the second source of REEs enrichment in kaolins.

2. Chondrite-normalized REE patterns of the kaolins show an overall enrichment of LREE (Lan/Smn=3-5 and Lan/Ybn = 6-19), HREE depletion (Gdn/Ybn = 1.3-2.6) and slightly negative Eu anomaly (Eu/Eu* >1), probably inherited from the parent rocks. The HREE and Y complexes remained in solution, separated from the LREE and subsequently precipitated at deeper levels of weathering profiles. High HREE contents in some studied profiles were also favoured by adsorption of REE and Y onto kaolinite surfaces.

3. The present study also show, that the total REE content of kaolin in basal part of weathering profile reaches maximum 0.1-0.2% in aqua regia soluble form at Litmanen and Eteläkylä deposits.

References