

ThanapongLhuaamporn 2012: Atomic Force Microscopy of Synthetic Corundum before and after Annealing. Master of Science (Earth Science and Technology), Major Field: Earth Science and Technology, Department of Earth Sciences. Thesis Advisor: Assistant Professor PornsawatWathanakul, Dr.rer.nat. 168 pages.

Samples of Verneuil synthetic pink sapphire and ruby were cut into different faces, i.e., [0001], [1 $\bar{1}$ 00], [0 $\bar{1}$ 10], [1 $\bar{2}$ 10], [$\bar{1}$ $\bar{1}$ 20], in order to investigate for their surface features in micro-nanometer scale before and after annealing at 1650 °C. The Atomic Force Microscope (AFM) was employed in cooperated with FTIR and UV-Vis-NIR spectroscopy to identify the annealing experienced by the samples.

The AFM images of the annealed samples exhibit multiple atomic steps with sharper edges and clearer step patterns than those of the unheated ones. The average step heights of most samples tend to increase after annealing. The untreated samples often showed the mono atomic steps (~0.22 nm) particularly on [0001] or c-planes. Multiple atomic steps usually formed after annealing with increasing step heights for about 10-100 times, i.e., ~2-20 nm. However, the average atomic step height on the annealed prism faces is usually less than that of the c-surfaces. FTIR spectra of unheated samples showed structural Ti-OH and possibly V-OH stretchings at 3309 and 3237 cm^{-1} , respectively. UV-Vis-NIR spectra showed Cr^{3+} absorptions at 405, 555 nm for both sample types, but the 695 nm presents only in the synthetic ruby.

The study can be further applied for possible investigations of heating evidences in natural corundum, and other gemstones.

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Thesis Advisor's signature

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