

Thesis Title	A Study of Characteristic Properties and Crystal Structure of Zircon Before and After Heat Treatment
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Abstract

This research was to determine the physical chemical properties and crystal structure of 167 rough zircons from seven occurrences before and after heat treatment program at 400, 600, 800, 1000, 1200, 1400 °C and aimed at findly out the procedure of heat treatment for any rough zircons to enhance their values.

The composition of mineral of zircons were found to be ZrO_2 74.7750(± 0.0354)% - 80.9 (± 6.7882) %, HfO_2 0.715(± 0.048) % - 2.3433 (± 0.1242)%, Sc 4.4(± 0.2) ppm - 17.1333 (± 1.1846) ppm, Eu 0.5715 (± 0.0182) ppm - 5.91 (± 0.5369) ppm by weight .

X-ray analys of zircon crystal structure before and after heat treatment showed the tetragonal unit-cell dimensions of $a = 6.269 - 6.478 \text{ \AA}$, $c = 5.626 - 5.950 \text{ \AA}$ and $a = 6.424 - 6.521 \text{ \AA}$, $c = 5.781 - 5.964 \text{ \AA}$ respectively.

The before heat - treated color of rough zircons was orange - yellow and orange - brown and the after heat - treated color change was colorless, blue(clear), yellowish(clear) and yellowish - brown.

Transparency of samples developed after heat - treated program. The refractive indices were increased from 1.550 - 1.800 (before heat - treated) to 1.800 - 1.950 (after heat - treated) . The birefringence and specific gravity of there samples increased from 0.020-0.0390 to 0.035-0.054 and 4.50 - 4.70 to 4.50 - 4.90 respectively.

Infrared absorption spectra of zircons were 2750, 2820, 3120, 3200, 3240 cm^{-1} . After heat treatment spectrum bands did not change but the main bands were sharper and this intensity increase before heat-treated bands.

The effect of heat treated of rough zircon at 400, 600, 800, 1,000, 1,200, 1,400 $^{\circ}\text{C}$ heat treated program found that of transforms orange- yellow, reddish brown rough zircon to be more remarkably colorless, blue or yellow. Temperature at between 800 – 1000 $^{\circ}\text{C}$ program were suitable to yield higher percentage of changing color of rough zircon, for fashioning into gemstone as colorless sky – blue zircon.

The preferred characteristic properties of rough zircon to be selected for heat-treatment were yellow - brown , greasy surface , high specific gravity and refractive index. This rough zircon should change to be sky - blue or colorless at 800-1000 $^{\circ}\text{C}$.

Keywords : Uniaxial crystal / Biaxial crystal / Colorless / Heat treatment