

Synthetic ruby with unusual chromium concentration

¹LEONYUK, N.I., ²BARILO, S.N., ²BYCHKOV, G.L., ²KURNEVICH, L.A. and ¹LYUTIN, A.V. ¹Geological Faculty, Lomonosov Moscow State University, 119899 Moscow, Russia; ⁴Institute of Physics of Solids and Semiconductors, BAS, 220072 Minsk, Belarus

Corundum, $\alpha\text{-Al}_2\text{O}_3$, belongs to the most popular materials with device potential, and colored crystals, for example, ruby and sapphire are found as highly prized gemstones. Particularly, the red of natural ruby corundum is due to contents of Cr^{3+} up to 1%, and additional V^{3+} (as a rule, 0.03-0.05%) intensifies the color. The interest in ruby crystals for gemology applications has led to a demand for crystals of color, real structure and habit like natural red corundum. The synthetic ruby contains maximum 2-3% of Cr_2O_3 admixture and it usually tends to grow with a plate-like habit having strongly developed $\{0001\}$ faces. Here, the authors discuss the composition and morphology of ruby crystals grown by flux method using $\text{Li}_2\text{O-MoO}_3$ (I), $\text{Li}_2\text{O-WO}_3$ (II), $\text{PbO-V}_2\text{O}_5$ (III) and $\text{PbO-V}_2\text{O}_5\text{-WO}_3$ (IV) as fluxes.

The crystals have been obtained in the temperature intervals of 1000-1100°C and 1200-1300°C. As a matter of fact, the concentration of Mo, W, V admixtures is not more than 0.06 at.%, Cr is less 2.0 at.%. In the case of IV flux, the ruby crystals contain up to 6.5 at.% of Cr. All these factors affect the growth rate of the crystal faces. The crystals grown at the temperatures 1000-1100°C (I and II fluxes) have a plate-like habit with a strongly developed pinacoid, but ruby synthesized in the temperature range of 1200-1300°C (II and IV fluxes) have more isometric crystal shape.

The crystal chemical interpretation is given to understand the influence of solvent type on morphology of ruby crystals.