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Aesthetic value improvement of the ruby stone using heat treatment and its synergetic surface study

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Abstract: The surface behavior of the natural ruby stones before and after heat treatment with metal oxide additives like: zinc oxide (ZnO) and lead oxide (PbO) have been studied. The surface appearance of the ruby stones processed with the metal oxides changed whereas the bulk densities of the stones remained within the range of 3.9 to 4.0 gm/cm³. The cracks healing and pores filling by the metal oxides on the surface of the ruby have been examined using scanning electron microscopy. The chemical compositions based on the XPS survey scans are in good agreement with the expected composition. The phase and crystallinity of the ruby stones original and heat-treated were obtained from their x-ray diffraction patterns. The change in peak separation between R₁ and R₂ - peaks in photoluminescence spectra and the contrary binding energy shift of the Al 2p peaks in the x-ray photoelectron spectra have been explicated. Moreover, in this work we describe the change in surface chemical and physical characteristics of the ruby stone before and after heat treatment.

Key words: ruby; heat treatment; metal oxide; photo-luminescence spectroscopy; photoelectron spectroscopy

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