COLOUR CENTERS AND SPECTRUM FEATURES OF IRRADIATION-TREATED YELLOW BERYL

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Irradiation, using a linear accelerator (8MeV), was carried out to alter the colour of colourless beryl from China. The experiment results show that two important types of colour centers are present in treated orange-yellow beryl. One is the unstable greenish-yellow hole center, similar to that in Maxixe-type beryl, and the other is the relatively stable orange-yellow impurity center of cation. The former is attributed to $Al^{3+}+O^{2-}\rightarrow Fe^{2+}+O^{-}$, and the latter is related to $Fe^{2+}\rightarrow Fe^{3+}+e$, based on EPMA, ESR, ultraviolet and visible absorption spectrum, cathodoluminescence, and chemical analysis of single minerals, The relative concentration of Fe^{2+} and Fe^{3+} and Fe^{2+}/Fe^{3+} ratio and $Fe^{3+}-O^{2-}$ Charge transfer tail site control directly the colour alteration effect of colourless beryl, at the same time, produces its corresponding characteristic absorption spectrum, fluorescence-emission spectrum, and ESR spectrum. The research also indicates annealing treatment at a low temperature (210°C) can be employed to eliminate the unstable, greenish-yellow colour center, and farther to extend the main wavelength and degree of saturation of the colour.

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