

Optical characteristics and mineral chemistry of colored fluorites from the mines of Mazandaran Province, and causes of their coloration

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(Received: 19/3/2019, in revised form: 26/6/2019)

Abstract: In order to understand the cause of coloration of fluorites, following experiments (UV-spectroscopy, irradiation by gamma ray and thermal bleaching) carried out on the colored and colorless fluorites from the mines of Mazandaran Province. All colored and colorless fluorites have absorption band in UV part of electromagnetic waves but deep-violet and brown fluorites have an absorption band in visible range, whereas colorless and white varieties have not shown any absorption bands. Irradiation of colorless fluorites by gamma-ray caused a new absorption bands in UV-visible range. Thermal bleaching of the deep-violet fluorite reduced its color to pale-pink color and also pale-violet colored fluorite changes to colorless ones. Chemically, deep-brown and deep-violet fluorites show (1) the maximum total concentration of rare earth elements (Σ REEs= 20 ppm), Y (9 ppm and 3.5 ppm for deep-brown and deep-violet fluorites, respectively) and (2) total concentration of radioactive elements (U+Th= 2.8 ppm and 7.9 ppm for deep-brown and deep-violet fluorites, respectively). Based on this study, lattice defects in crystal structure of fluorites due to U and Th decay were caused the color centers (F-centers) as most important cause of fluorite coloration. This was confirmed by gamma-ray irradiation and color bleaching experiments.

Keywords: *fluorite; coloration; absorption bands; mineral chemistry.*

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