

VIS-spectroscopy Study of Co-blue spinel from Luc Yen, Vietnam.

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Nowadays “cobalt” blue spinel is considered as the most expensive and sought-after spinel on the gemstone market due to its unusual bright color. It is believed that this neon-like color is the result of the accumulation of Co^{2+} and / or Fe^{2+} impurities in the spinel structure. However the precise position of Co^{2+} in the structure of blue spinel is still open. Some argue that cobalt occupies octahedral position [Huong et al., 2018], others – tetrahedral [D’Ippolito et al., 2015; Chauvire et al., 2015].

Detailed investigation of 22 blue spinel crystals from Luc Yen, Vietnam with LA-ICP-MS allows us to outline its average chemical composition in regard with trace elements. In comparison with spinel of blue color from other deposits [D’Ippolito, 2013, D’Ippolito et al., 2015, Peretti, 2003 and our unpublished data] studied samples characterise by higher Li, Ga, Cr, Co and Ni, and lower Fe, Mn, Zn. Co concentration vary from 77 to 297 ppm and Fe from 2590 to 10500 ppm.

In order to determine the position of Co in the crystal structure of “cobalt” spinel, the visible absorption spectra were measured for 4 samples. Figure 1 shows that the peak intensity of Co^{2+} ions in the spinel: 544, 551, 578, 623, which is in a good agreement with data of previous researches [Chauvire et al., 2015]. In addition, the fan-like peak characteristic of Co^{2+} ions is in the range of 550-650 nm, which indirectly confirms that the blue color of spinel is due to cobalt but not iron [Platonov et al., 1984]. Also the Co^{2+} peak is positioned at 544 nm which is typical for Co^{2+} in the octahedral position [Cotton et al., 1999].

Since the peaks of Co^{2+} ions are in the range of 550–650 nm, we may assume, that Co^{2+} ions in the blue spinel of Luc Yen occupies both octahedral and tetrahedral positions in the structure of the mineral [Platonov et al., 1984]. Also Co^{2+} and Fe^{2+} peaks are equally suited to wavelengths for blue spinel.

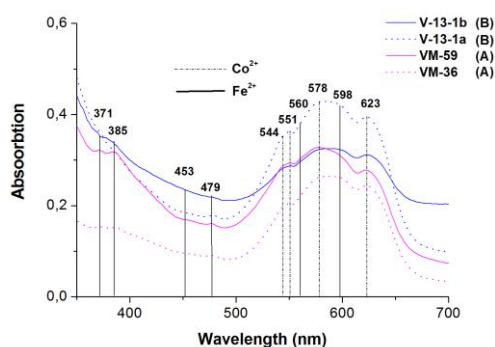


Figure 1. VIS-spectra of blue spinel from Luc Yen, Vietnam.

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