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The role of different network modifying cations on the speciation of the Co²⁺ complex in silicates and implication in the investigation of historical glasses.

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Abstract

In the last decades the speciation of the cobalt complex in a glass matrix has been extensively studied. Bivalent cobalt ions in glasses of different composition commonly adopt a tetrahedral coordination, though hexa- or penta-coordinated species are also possible. Changes in the absorbance spectrum of Co-doped glasses were attested in previous studies according to the introduction of different modifying cations. A shifting of the first sub-band characterizing the typical triplets of tetrahedral Co²⁺ ions in both the visible and near infrared regions was observed, but discrepancies in literature suggested a relevant role of glass composition on the definition of the optical signature of cobalt. Co-doped glasses with different composition (soda-lime, potash-lime, mixed alkali and ZnO-Na₂O-CaO-SiO₂) were studied via Fiber Optic Reflectance Spectroscopy (FORS). Pseudo-Voigt functions were used for the deconvolution of the absorbance spectra and the features of the bands characteristic of each cobalt complex were investigated. The structural role played by each modifying cation and the fundamental implications of glass basicity on the speciation of different Co-complexes were stressed. Changes in glass structure

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