A Ni-coloured glass study : Synthesis & Optical Absorption Spectroscopy.

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Glass color can be related to nature, valency and coordination number of transition elements present in composition (Bamford 1962, Galoisy et Calas 1991). Thus, Ni-bearing glass color goes from brown to deep-purple, including yellow. Nickel environment has been investigated in several glasses, using UV-Vis-NIR spectroscopy. This spectroscopy reveals informations on structural sites occuped by transition elements in the glasses.

Several compositions were synthesized, in order to understand influence of alkali or alkaline earth cations, for example. Results agree with some earlier studies : $^{[4]}$Ni has been identified in aluminosilicate K-bearing glasses, whereas both $^{[4]}$Ni and $^{[5]}$Ni exists in other silicate or aluminosilicate glasses. Major influence of charge-compensating cations has been confirmed, particularly when weakly polarizing charge-compensating cations enable Ni to behave has a network forming cation. In borosilicate glasses, Ni has been identified with three coordination numbers (4, 5 & 6), in relation with variable K/B ratios : Ni coordination number grow with alkali quantity. Furthermore, whereas $^{[6]}$Ni does not exist in silicate glasses, two spectra (BK_3 & BK_4), show bands associated with some of its transitions. For the first time, Ni has been found under three coordination numbers (4, 5 & 6), in the same glass. Existence of $^{[6]}$Ni in these borosilicate glasses is an evidence of Ni-enriched domains, hypothesis previously made.

The extinction coefficient characteristic for each coordination site may be determined by charachteristic optical transitions. Their determination allows to determine the relative proportion of the various coordination states of nickel oxyde in glasses. It is then possible to rationalize nickel coordination chemistry in glasses as a function of the nature and concentration of the other cations present in the glass.