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XANES Studies on the Oxidation States of Copper Ion in Silicate Glass

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Abstract : The silicate glass was prepared using rice husk as the source of silica. The base composition of glass sample is composed of SiO2 (from rice husk ash), Na2CO3, K2CO3, ZnO, H3BO3, CaO, Al2O3 or Al, and CuO. Aluminum is used in place of Al2O3 in order to reduce Cu2+ to Cu+. The red color of Cu2O in the glass matrix was observed when the Al was added into the glass mixture. The expansion coefficients of the copper doped glass are in the range of 1.2 x 10-5-1.4x10-5 (ºC -1) which is common for the silicate glass. The finger prints of the bond vibrations were studied using IR spectroscopy. While the oxidation state and the coordination information of the copper ion in the glass matrix were investigated using X-ray absorption spectroscopy. From the data, Cu+ and Cu2+ exist in the glass matrix. The red particles of Cu2O can be formed in the glass matrix when enough aluminum was added.

Keywords : copper in glass, coordination information, silicate glass, XANES spectrum
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