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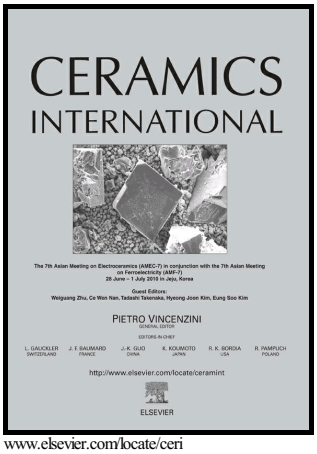

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Synthesis and Structure of Transparent Zinc-Niobate-Tellurite Glasses with Low Hydroxyl Content

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ABSTRACT

Low-hydroxyl (OH)-content, transparent zinc-niobate-tellurite glasses (TeO_2-Nb_2O_5-ZnO and TeO_2-Nb_2O_5-$ZnCl_2$) were synthesized by using dry-air atmospheres, stirring of the melt, and preheat treatment before melt preparation. A low OH level (79.8 $\pm$ 6.3 ppm) was achieved by performing a preheat treatment of mixed raw chemicals with zinc chloride and then melting in both open- and dry-air atmospheres with several counts of intermittent stirring. However, this sequence of processes resulted mainly in non-crystallized, opaque products. The basis of this opacity was investigated by performing Raman spectroscopy, X-ray diffraction (XRD), and X-ray fluorescence (XRF) measurements on both the opaque and transparent glasses. Raman spectroscopy revealed that the proportion of Te-O-Te bonds, relative to tellurite unit structures (TeO_4, TeO_{3+1}, and TeO_3), in the opaque glasses decreased with increasing isolated structures of TeO_3^{2-}. This decrease resulted possibly from atomic-scaled inhomogeneity and immiscible domain formation in the melts and corresponding glasses, which have less amounts of residual OH

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