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Transparent Phosphosilicate Glasses Containing Crystals Formed During Cooling of Melts

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Effect of P_2O_5 - SiO_2 substitution on spontaneous crystallization of SiO_2 - Al_2O_3 - P_2O_5 - Na_2O - MgO melts during cooling was studied by X-ray diffraction, differential scanning calorimetry and scanning electron microscopy. Results show that substitution of P_2O_5 for SiO_2 enhances the structural polymerization of silicate-rich phase in the melts as a result of formation of orthophosphate complexes, and thereby the spontaneous crystallization of cubic Na_2MgSiO_4 is also enhanced during cooling of the melts. In addition, the sizes of the local crystalline and separated glassy domains are smaller than the wavelength of the visible light, and this leads to the transparency of all the obtained glasses.