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Transparent Phosphosilicate Glasses Containing Crystals Formed During Cooling of Melts

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Effect of P₂O₅-SiO₂ substitution on spontaneous crystallization of SiO₂-Al₂O₃-P₂O₅-Na₂O-MgO melts during cooling was studied by X-ray diffraction, differential scanning calorimetry and scanning electron microscopy. Results show that substitution of P₂O₅ for SiO₂ 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 Na₂MgSiO₄ 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.