Influence of crystalline phases on optical characteristics of a glass-ceramic in the visible range

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Abstract

Since 1958, opal glasses have been one of Arc France most popular produced products. Such compounds are obtained by melting a mixture of precursors through a cold-top furnace at approximately 1500 ∘C. Then, from a casting at about 1100 ∘C, forming machines give the shape to the glass articles that are subsequently quenched in air to achieve specific properties. The resulting ceramic glasses are characterized by a milky white color and exhibit a remarkable mechanical resistance. These opal glasses consist of a glassy matrix built upon silicon dioxide network containing crystalline fluoride phases (about 10 wt%). As reported in the literature, the presence of such well crystallized compounds causes the glass opalization (1,2). Few parameters such as refractive index, concentration, size and dispersion of the colorless crystalline particles strongly impact the overall color rendering. The desired control of all these parameters during the manufacturing process can be intricate but the impact of the aforementioned variables can be modelled via the 4-Flux method (3,4). Then, transmitted and reflected, diffuse and specular fluxes can be calculated and the impact of each of these parameters determined. The color of these ceramic glasses will be discussed based on this model through the correlation between simulation and observation. The role of the crystalline part nature will be specially highlighted.

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