Glass and glass-ceramic formulation: an introduction

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Abstract

There is an ever-growing demand for energy to power computers, vehicles, and everything in between. The choices around environmentally responsible energy sources have been hotly debated over the last decade, given concerns about the effects of human activity on our planet. As a response to these concerns, industry is moving towards decarbonization of their energy sources and processes, necessitating transitions to greener fuels, materials, and processes. The glass industry has taken these challenges seriously, vowing to reduce the CO2 footprint and overall environmental impact through process and potential formulation changes. However, current and newly conceived products still need to perform as needed. The glass industry has demonstrated its adaptability before, for example the removal of arsenic oxide from optical glass compositions. By connecting fundamental science through to industrial know-how, it is possible to reimagine glass manufacturing for a sustainable future. In this presentation, some strategies for formulation of complex glasses and glass-ceramics are offered. Examples are given for nuclear glasses and optical glasses. The focus is on oxide glasses, but complementary examples are also given for chalcogenide and halide systems. A focus is given on effects of different raw materials on properties and processing, as well as on substitutions and tolerance of impurities.

Keywords: formulation, optical glass, nuclear glass, glass, ceramic

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