

Reducing Carbon Footprint of Glass Melting: Technology Innovations, Present Status, and Strategies for the Future

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Abstract

The energy intensity of production for glass (4 – 10 GJ/t) is considerably less than that for steel and aluminum but higher than that of cement. Though moderate in ranking, the global direct CO₂ emission from the glass industry was nevertheless about 95 million metric tons in 2021. The latest UN climate report stipulates that global greenhouse gas emissions would have to peak “before 2025 at the latest, and be reduced by 43 per cent by 2030” in order to limit global warming to 1.5°C. It is, therefore, imperative that decarbonization be pursued across all the activities and sectors, including the glass production.

Over the last several decades, driven by economic and environmental compliance imperatives, the glass industry has implemented design, process, and materials innovations that have led to substantial gains in energy and production efficiencies, and consequently, resulted in significant reductions in the energy and the carbon intensities of glass production. Much more, however, needs to be done to further decarbonize glass production.

The lecture will encompass two major themes. First, it will review some of the glass melting technology innovations by the speaker and his colleagues that advanced the frontiers of industrial glass melting technology and led to the advances mentioned above. This will be followed by a discussion of the technical challenges and the strategies for further reduction in the carbon footprint of glass melting.