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Bubble formation in melts with basalt-like composition

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The homogeneity of glasses is an important quality parameter and therefore of major importance to glass melting technology. Beside inhomogeneities such as striae, bubbles reduce the quality of melts due to the highly different mechanical and optical properties between melt and gas. In this work, basaltic melts produced in a cupola furnace and cooled to T_g within 10s are used for inspection of bubbles. This inhomogeneous, striated glass contains 0.32 Vol% bubbles with a bimodal size distribution. The smaller bubbles with an average diameter of approx. 4 μm contribute to 0.07 vol% to the glass while bubbles with a diameter larger than 20 μm contribute to 0.25 vol% to the glass. The bubble volume distribution indicates that the bubbles are created through at least 2 mechanisms. As large numbers of smaller bubbles are present, the bubble nucleation mechanism must be highly efficient. Detailed microscopic investigations of the size and location of small bubbles show, that they are randomly distributed. In the striated glass, the bubble occurrence is independent of the striae.