O317-Identification of bubble generation potential of glass melts with low DC voltage by direct observation

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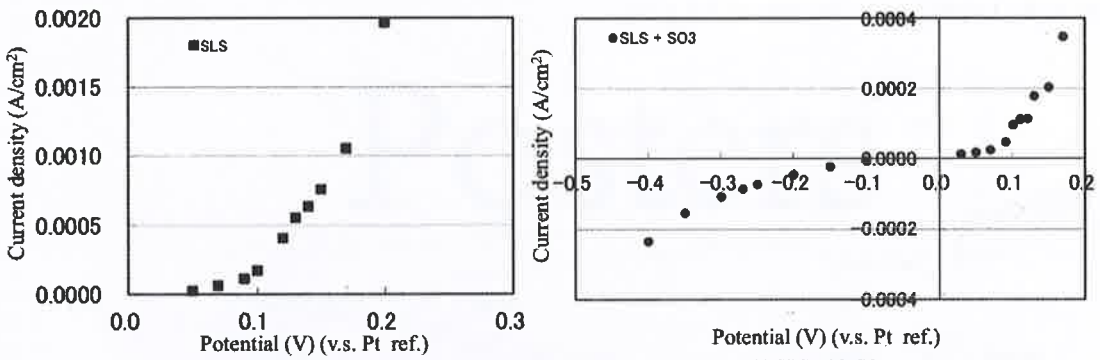
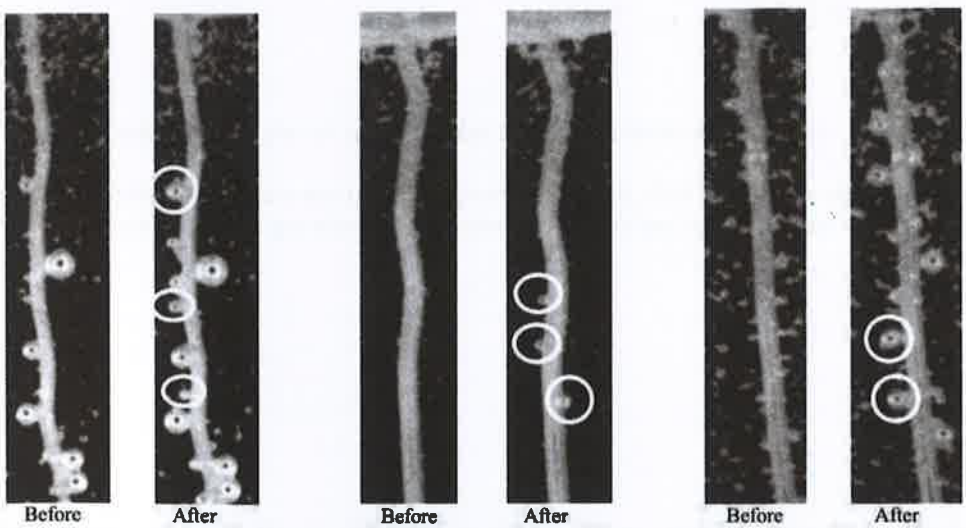
Bubble in glass products is one of principal defects and of major concerns in the glass industry. Some of bubbles are caused by electrochemical reaction in the glass production. In an attempt to identify the bubble generation potential in soda-lime silicate glass (SLS) melts with different fining agents (SO3, SnO2, Sb2O5), direct current voltage is applied between working and counter electrode in a silica crucible and bubble generation on the electrode is confirmed by high-temperature observation (HTO) system. Oxygen bubble generation potential at the anode is around +0.10 V at 1300 ℃ (Fig. 1 and Fig. 2(a) and (c)) regardless of the type of fining agent added. It was found that the SO2 bubble generation potential at the cathode with the addition of SO3 is around -0.30 V (Fig. 1(b) and Fig. 2(b)). The effect of glass composition and voltage drop on bubble generation potential will be also discussed. These new data could provide fundamental understandings on the bubble generation by electrochemical reaction in the glass manufacturing process.



(a) SLS (b) SLS with SO_3

Fig. 1. Current density – potential curves at 1300℃ for a soda-lime-silicate glass with and without SO_3.



(a) SLS, +0.07 V (b) SLS with SO_3, -0.30 V (c) SLS with SO_3, +0.10 V

Fig. 2. HTO images of working electrode before and after electrolysis test at 1300℃ on (a) SLS at the anode (b) SLS with SO_3 at the cathode and (c) SLS with SO_3 at the anode.