

Nano-layered-structure interface and Zinc diffusion of borosilicate glass during sealing process

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The interface microstructure and element diffusion between a borosilicate glass and an AISI3040 steel was investigated. Pre-oxidation of the steel was performed in a low pO_2 atmosphere before sealing process. The oxidation layer is composed of Cr_2O_3 , $MnCr_2O_4$ spinel and SiO_2 . From Energy dispersive X-ray spectra (EDS) analysis, a significant Zinc diffusion between glass and metal has been observed. High resolution images showed that Zinc selectively migrated from the glass to $MnCrO_4$ grains, while no Zinc was detected in Cr_2O_3 grains. Transmission electron microscopy (TEM) studies revealed that there exists a nano-layered-structure with a thickness of about 2 nm in the glass-to-metal interface. Another important feature is the enrichment of potassium and calcium elements in the nano-layer. This may be attributed to the migration of these elements from the glass during sealing process.

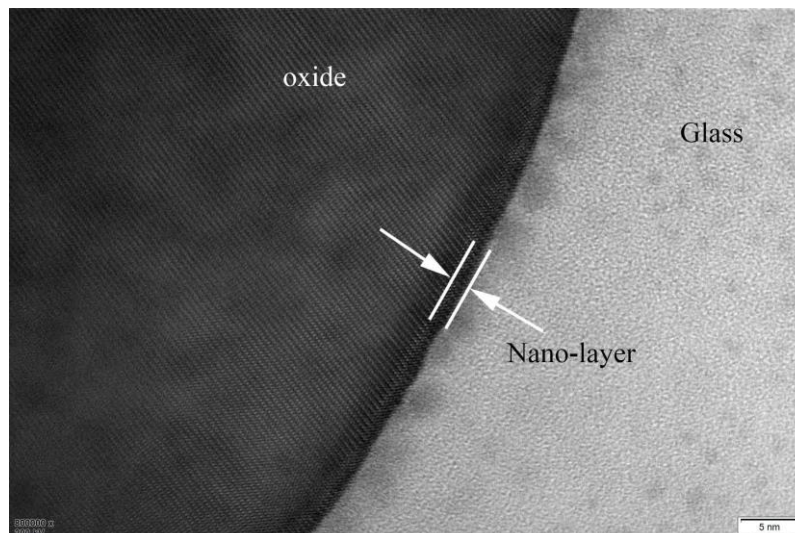


Figure 1. HRTEM image of nano-layered-structure interface between the glass and the metal.