



**UNIVERSITÀ
DI TRENTO**

**Dipartimento di
Ingegneria Industriale**

DII

Seminar



Surface and Near-Surface Issues in Ion Exchange in Silicate Glasses

November 26 2024, 11:00 AM

Seminar room, Polo Ferrari 2 - Via Sommarive 9, Trento

Speaker: Guglielmo Macrelli, Isoclima S.p.A.

Ion exchange in silicate glasses is a widely used process to increase glass strength and to modify the near-surface refractive index of glass for optical applications. The interface between glass and the reservoir of the alkali ions to be exchanged, usually a molten salt bath, is just the glass surface. A model is introduced where the time to achieve the equilibrium condition at the glass surface is far lower than the overall time of the full ion exchange process. This approach allows a thermodynamic equilibrium treatment of the surface and a kinetic non-equilibrium treatment of the interdiffusion process towards the bulk of the glass.

Thermodynamic equilibrium conditions for ion exchange of alkali ions are discussed for soda-lime and alkali aluminosilicate glasses. The connection between surface equilibrium and kinetic description is discussed in terms of boundary conditions for the interdiffusion equation.

Surface mechanics related to tribological effects is discussed in terms of surface flaws healing and indentation interaction effects with residual stress field. Residual compression stress induced by ion exchange increases the glass strength. Under sharp indentation, ion exchange - induced compression stresses reduce crack initiation by the suppression of median and radial cracks.

Info

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