

LOWER-COST STRENGTHENED GLASS SUBSTRATES

Patent Pending
SD# 15362, 15364, 15379, 15384, 15385, 15416
Technology Readiness Level: 2-3
Concept Demonstrated Analytically or Experimentally

Lower-cost strengthened glass substrates for smart phones, smart watches, tablets and other durable, impact-resistant applications

Glass substrates with enhanced strength and durability are in high demand for use in handheld devices and electronic displays. Currently, glass strengthening is achieved using alkali ion-exchange techniques, where high temperature molten-salt baths are used to produce a thick surface layer under compression that suppresses crack formation and fracture propagation. While effective, this technique presents high costs and notable limitations for industry; long exchange times in molten alkali salt baths limit surface compression values, the bath-aging effect of molten salts can result in undesirable variations in batch uniformity, and high temperatures increase manufacturing costs. Together, these factors prompt the search for improved glass strengthening techniques.



Sandia researchers have developed a more efficient thermal process for strengthening glass substrates for smart phones, smart watches, tablets, and other durable impact-resistant applications. Instead of using pure alkali salts, this novel approach uses eutectic alkali salt mixtures and employs thick film coating methodology to deposit the needed salt mixtures. Due to lower melting points, the eutectic coating facilitates alkali-ion exchange at lower temperatures, thereby reducing production costs. Since this method does not reuse the alkali metal coating, it affords improvements in batch uniformity and quality over industry standard molten-salt bath processes. This technique may also be useful for simultaneously strengthening and curving a glass substrate as well as for strengthening thin or moderate thickness substrates — promising features and characteristics which offer versatility for new and emerging applications.

TECHNICAL BENEFITS

- Results in a higher degree of compression at lower temperatures
- Eliminates the need for salt bath processes
- Enables large-scale batch processing
- Reduced production costs
- Improved quality and batch uniformity
- Versatility- may be used to strengthen thin or moderate thickness substrates, or to simultaneously strengthen and create curved glass bodies

INDUSTRIES & APPLICATIONS

- Handheld devices, including smart phones, smart watches, and tablets
- Communications
- Electronic displays