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Invited Talk

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Crack Resistant Alkali Aluminoborate Glasses

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Abstract: Alkali aluminoborate glasses are found to exhibit favorable mechanical properties, especially high resistance to indentation cracking, due to their relatively low resistance to network compaction during sharp-contact loading. We study the origin of the high crack resistance by measuring changes in structure and mechanical properties in both peralkaline and peraluminous compositions with different alkali cations. The network densification mechanism during both indentation and hot compression involves an increase in the average coordination number of both boron and aluminum and a shortening of the sodium-oxygen bond length. The glasses most prone to network compaction exhibit the highest damage resistance, but surprisingly the crack resistance scales better with the relative density increase achieved by the hot compression treatment rather than with the extent of densification induced by indentation. As such, tuning the network structure may lead to the development of more damage resistant glasses.