Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Conductivity thresholds and glass structure in $(K_2O)_x(GeO_2)_{1-x}$ glasses[1] NINGHUA WANG, DEASSY NOVITA, PUNIT BOOLCHAND, University of Cincinnati — There are reports of conductivity thresholds with glass composition in solid electrolyte glasses. In the titled glass system, a seven order of magnitude increase in conductivity[2] occurs at x > 0.10. The origin of the observation remains an open question. In titled glasses, we show that glass structure probed by the elastic behavior of its backbone shows two thresholds, a stress transition near x = 0.04 and a rigidity transition near x = 0.09. These elastic thresholds emerge from the reversibility window[3] observed in calorimetric measurements, and in Raman scattering experiments that show scattering strength of the 520 cm^{-1} mode of 3-member rings to show a global maximum in the reversibility window. The pronounced increase of conductivity apparently occurs when backbones become flexible at x > 0.09, permitting K^+ ions to freely diffuse. The correlation between the electrical, thermal and optical properties of the present solid electrolyte glasses may well be a generic feature of these materials.

[1]Supported by NSF grant DMR 04-56472.
[2]Jain et al JNCS 222, 361 (1997).
[3]S. Chakravarty et al. J.C.M.P 17,L1-7 (2005).

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Date submitted: 17 Nov 2006 Electronic form version 1.4