Molecular origin of the giant conductivity enhancement in (Ag$_2$S)$_x$(As$_2$S$_3$)$_{1-x}$ glasses$^1$ CHAD HOLBROOK, P. BOOLCHAND, University of Cincinnati — The solid electrolyte additive Ag$_2$S is found to homogeneously alloy with base As$_2$S$_3$ glass at low concentrations (x < 6%, single: T$_g$ = T$_{g}^{high}$ $\sim$ 210°C), but it rapidly segregates as a Ag-rich glass phase at medium concentrations (6% < x < 20%, bimodal: T$_g^{high}$ and T$_g^{low}$ $\sim$ 170°C), and becomes the principal glass phase populated at higher x > 35% (single: T$_g^{low}$) as revealed by modulated calorimetric measurements. The stoichiometry of the Ag-rich (T$_g^{low}$ phase) is suggested to be near AgAs$_3$S$_7$ at x $\sim$ 25% but becomes closer to that of Smithite (AgAsS$_2$) at x > 40%, as revealed by Raman scattering. In the 9% < x < 14% composition range, one observes, in calorimetric experiments, the opening of a reversibility window, and a pronounced increase in the fractional population, R(x), of the Ag-rich glass phase, both of which correlate well with the 5-orders of magnitude increase in electrical conductivity$^{1,2}$ across this compositional interval. In the same interval molar volumes on our samples show a local plateau. These observations suggest a new interpretation of the giant electrical conductivity enhancement observed at x > 15% in the present electrolyte glass system. $^1$E.A. Kazakova and Z.U.Borisova, Fiz. Khim.Stekla 6, 424(1980).

$^1$NSF grant DMR 04-56472