Physica shown that iso- and aliovalent cation substitutions affect the clue to the higher effective ion charge value. Deviation from Vegard law and decrease the increase the number of concentrations in comparison with substitution in B-sublattice. Among the semiconducting materials with aliovalent substitutions of concentrations in comparison with substitution in B-sublattice.

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The aim of the present work was to study the effect of iso- and aliovalent substitutions in cation sublattices on the formation and properties of semiconductive solid solution based on barium titanate.

It has been found that in the case of aliovalent substitution in A-sublattice semiconductive properties occur in a more wide range of concentrations in comparison with substitution in B-sublattice. It has been shown that high concentrations of aliovalent ions increase the number of barium vacancies, hinder the grain growth and decrease the degree of tetragonal distortion of crystal lattice. Among the semiconductive materials with aliovalent substitutions in B-sublattice, tungsten-doped ceramic has the largest grain size due to the higher effective ion charge value.

It has been revealed that the isovalent substitutions at A-site change the degree of tetragonal distortion of crystal lattice with deviation from Vegard law and decrease the grain size. It has been shown that iso- and aliovalent cation substitutions affect the electrophysical properties of semiconductive solid solution based on barium titanate. It has been found that the varistor effect is nonlinearly dependent on grain size.

Materials II
Non Crystalline Systems

MS10.02.01 Neutron diffraction studies of fast-ion conducting chalcogenide and related glasses. Philip S. Salmon, Shuqin Xin, School of Physics, University of East Anglia, Norwich, NR4 7TJ, UK.

The metal-metal partial structure factor and related difference functions, as measured using the method of isotopic substitution in neutron diffraction, are compared for several fast-ion conducting and semiconducting chalcogenide and chalcophile glasses which contain either Ag or Cu. The objective is to provide definitive structural information at the microscopic level so that realistic non-phenomenological models for ionic motion can be developed or the absence of fast-ion conductivity explained. For ternary chalcogenide glasses of the form M-A-X, where M denotes Ag or Cu, A a Group IIB or VB element and X a chalcogen (S, Se, Te), it is found that the M atoms are not randomly arranged but have an important role in defining the glass structure. Irrespective of the electrical conductivity mechanism, the short range order of the network former (e.g., AX or A₂X₃) is not destroyed on mixing with a large mol. % of network modifier (e.g., M₂X₃), and features of the intermediate range order in the high temperature crystalline phase of the network modifier are retained.

The results lend support to a modified random network model in which the network modifiers and formers preserve some elements of their characteristic ordering to form two interfacing networks. The absence of ionic conductivity may therefore arise from the presence of defects which block the long-ranged translational motion of metal ions along percolation pathways which have a structure resembling that of the network modifier. Alternatively, translational motion may not occur owing to a local trapping of the metal atom in the potential well of its nearest-neighbours and a full comparison of the results supports this latter model in the case of the semiconducting M-A-X glasses.