

Laser desorption ion (LDI) quadrupole ion trap mass spectrometry of Sb_mSe_n clusters generated from laser ablation synthesis of antimony and selenium mixtures

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Antimony forms just a few selenides, e.g. Sb_2Se_3 . Recently, $Ba_2Sb_2Se_5$ and $Ba_6Sb_7Se_{16}$ [1] were synthesized via high-temperature solid-state reactions and their structures were determined by single crystal X-ray diffraction. Even huge $[Sb_{12}Se_{20}]^{4-}$ anion was prepared and characterized [2]. Antimony selenide can be made in the form of nano-fibres [3] and it is part of Ge-As(Te)-Sb-Se chalcogenide glasses [4-6], for example. Another example is “classical” GeSbTe (germanium-antimony-tellurium or GST) glass used in rewritable optical discs and phase-change memories. The structure of some selenium and antimony clusters has been determined.

In this work binary system Sb-Se is studied generating new Sb_mSe_n clusters via laser ablation synthesis using antimony-selenium powdered mixtures of elements in various ratio. Mass spectra were recorded using mass spectrometer of Axima Resonance (Kratos, Manchester, GB) afforded with quadrupole ion trap and TOF detection. Stoichiometry of Sb_mSe_n clusters was determined via computer modelling of isotopic envelopes. It was shown that a series of Sb_mSe_n clusters ($SbSe_{1-7}$, Sb_2Se , Sb_3Se , etc.) are formed. The knowledge gained can contribute to elucidate structural items of Sb_mSe_n materials. Possible structure of Sb_mSe_n clusters was discussed and related to the proposal of manufacturing new chalcogenide glasses phase-change materials.

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