Gallium-tin alloy as an alternative to liquid tin for the generation of efficient 13.5 nm EUV light

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Extreme Ultraviolet Lithography (EUVL) is a promising technology set to produce the next-generation of integrated circuits. Currently, liquid tin is the target of choice as it produces efficient 13.5 nm light, which can be collected and projected onto a wafer. However, liquid tin produces a lot of debris that can damage optics, as well as suffering from the limitation that over 230°C is required to maintain a liquid state. Our research has focused on alternative sources of EUV light. One such source is a gallium-tin (Ga-Sn) alloy. Gallium has a very low melting point (29°C), and with the addition of tin, can produce efficient 13.5 nm light. We investigated Ga-Sn alloys with different atomic weight percentages, characterizing the alloy by DSC, XRD, and EUV spectroscopy. Initial findings show that the tin content about 30% will result in a strong emission at 13.5 nm, yet the melting point is below 100°C. However, in some cases the alloy was not eutectic, which is a concern for reliability. The preparation, characterization and EUV data are discussed in this paper.

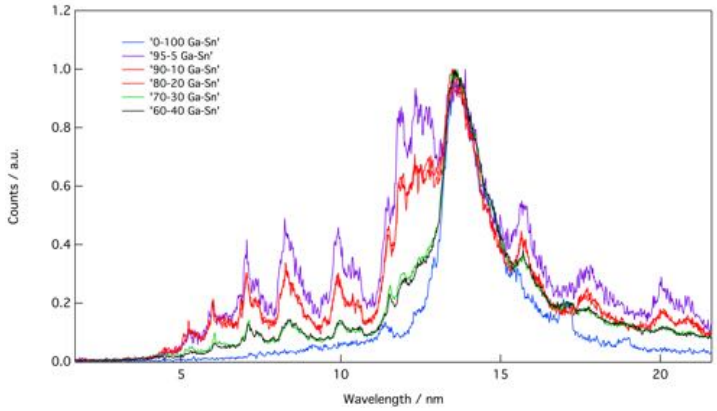

Fig 1. The normalized EUV spectra of a number of different Ga-Sn alloy ratios show that change in spectrum according to the Sn content.