Fabrication and aero dynamic levitation of chalcogenide glass spheres

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Spheres of gallium-lanthanum sulphide (GLS) and gallium lanthanum sulphite (GLSO) have been produced by laser irradiation on a copper hearth. Although similar fabrication techniques have been applied to oxide glasses, the technique has been overlooked for the production of chalcogenide glasses due to the perceived problem of the volatility of the chalcogens. In this work, glass microspheres of GLS/GLSO have been fabricated by laser irradiation of micron size irregular shaped glass particles on a Cu plate. In this material we found that evaporation of sulphur was not substantial as it appears to be more strongly chemically bound [1]. In addition to this method we have also established that it is possible to form larger spheres (mm diameter) of GLSO by aerodynamic levitation and laser heating using a CO_2 laser (10.6 μm wavelength). Our studies involve overheating and supercooling of liquids and melts, outgassing analysis, high temperature resistivity measurements, and crystallization/structural studies [1-3]. In both fabrication methods the glasses could be melted and re-vitrified with low sulphur mass loss. We conclude that the production of glass spheres by laser irradiation[4] from irregular shaped starting material on a substrate using the wetting principle has substantial benefits for making microspheres and nanospheres.

References

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