The synthesis of amorphous semiconductor films with nanometer-sized clusters is being developed in distinct laboratories for application to photovoltaic devices. It is desirable to control the size of the clusters with dimensions of the order of 20 nm because they improve the absorption characteristics of the films with nanoclusters in most of the solar spectrum. For the relationship between the size of the QDs and effective bandwidth, the confinement potential can be selected independently of the type of semiconductor QDs and rely solely on the matrix material by the relationship between the bandwidth and the film thickness. So far researchers have studied different QDs-matrix systems such as silicon QDs in SiO2 matrix, TiO2: Ge; and CdTe, PbS, PbSe, InP, PbSe, InAs, CdS in Oleic Acid. Several of these systems have problems of instability or lack of control in the size and distribution because the number of atoms involved in the system QDs-matrix can produce unstable phases. Forming nanocrystals germanium (Ge) or silicon (Si) in matrices of amorphous germanium (a-Ge) or amorphous silicon (a-Si) is desirable because the active film would have a single component without the possibility of forming secondary phases. For Ge in the literature are reported bandwidths of 1.3 eV for nanocrystals of 6 nm in diameter which allow the manufacture photovoltaic cells working in the near-infrared range or tandem cells if different sizes of nanocrystals are controlled to make better use of solar spectrum. In this work the formation of Ge crystalline clusters in a matrix of amorphous germanium (a-Ge) was studied, the films were grown by DC sputtering in the temperature range of 300 to 800K at 300 Watts in argon atmosphere using Ge targets of 5N. Crystalline Ge clusters were obtained with dimensions in the range of 5 to 10 nm according to GIXRD measurements. The films were also characterized SIMS, ellipsometry measurements, and Raman spectroscopy.

SIMS measurements indicate the films have a high content of oxygen and hydrogen which originates from inside walls chamber of the sputtering equipment. A mechanism through which the formation of Ge nanosized clusters is induced by the presence of oxygen and water molecules adsorbed to the sputtering chamber walls is proposed.

**Keywords:** Nanostructure, Solar Cell, Germanium

**References:**


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