E-beam Evaporator

Model: Auto 500 Vacuum Coating System, Hind High Vacuum Company, Bangalore, India

Electron Beam (E-beam) evaporation is a Physical Vapor Deposition process in which the target material to be used as a coating is bombarded with an electron beam from a charged tungsten filament to evaporate and convert it to a gaseous state for deposition on the material to be coated. Taking place in a high vacuum chamber, these atoms or molecules in a vapor phase then precipitate and form a thin film coating on the substrate. Electron Beam Evaporation can yield significantly higher deposition rates from 0.1 nm per minute to 100 nm per minute, resulting in higher density film coatings with increased adhesion to the substrate\(^1\).

The Auto 500 E-beam evaporator from Hind High Vacuum company, Bangalore, India is used for thin film deposition with the accuracy of 1- 2 nm. To operate the equipment, the e-beam chamber should reach the vacuum pressure below

\(^1\)http://www.semicore.com/news/89-what-is-e-beam-evaporation
5 × 10⁻⁶ mbar. High vacuum pressure is achieved using turbo molecular pump. Tungsten is used as the field emission electron source. The energy of the electron beam can be operated up to 8 KeV. Inside the chamber, the hearth contains four cavities above which graphite crucibles contain target material. The system has an Inficon SQC-310 controller deposition controller which automated the whole process and multilayers can be deposited without breaking the vacuum. The substrate can be controlled heated up to 300°C using IR heater.

Specifications/Functions:

- Substrate heating: 300°C.
- E-beam energy: 8 KeV.
- Process pressure: 5 × 10⁻⁶ mbar.
- Materials available for deposition: Ti, Al, Ag.
- Minimum thin film thickness: 1 to 2 nm.
- Other materials such as Cr, Ni, Mg, Au, Pt can also be deposited. However, users must need to bring Au and Pt targets.