

Detector for measuring electron energy in scanning electron microscopes

CSIC, the University of Cádiz and the University of Seville have developed a detector to measure electron energy in SEM (Scanning Electron Microscope). The detector allows to measure both the intensity and the energy of electrons that are generated in it. This is a very important development. Until now, solid state detectors only measured the intensity of the signal and it was not possible to differentiate whether the changes in the measured signal were due to a change in intensity or to a change in the energy of the incident electrons.

Industrial partners are sought to collaborate through a patent licence agreement.

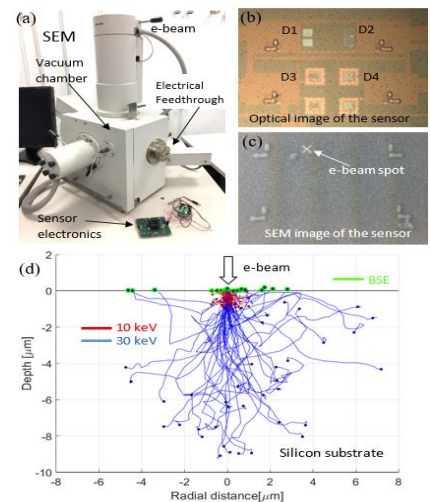
An offer for Patent Licensing

New device that allows to measure the energy of electrons in an SEM

There are two existing devices for measuring electrons in electron microscopes: energy filters for electrons and solid state detectors.

Electron energy filters allow spectra with energy resolutions to be obtained. These filters are a bulky system that is difficult to integrate into the limited space of SEMs. This fact means that these are only used in other types of microscopes, known as TEM. Solid-state electron detectors, which are used in SEM, only allow signal intensity to be measured. Therefore, it is not possible to detect whether changes in the measured electrical signal are due to a change in intensity or to a change in the energy of the incident electrons.

The proposed detector for measuring the energy of electrons in scanning electron microscopes makes it possible to overcome the aforementioned limitation. Specifically, the device allows to measure the intensity and also the energy of electrons PE (Primary Electrons), TE (Transmitted Electrons), SE (Secondary Electrons), BSE (Backscattered Electrons) that are generated in SEM.



a) Scanning electron microscope (b) Optical image of the sensor with four types of photodiode. (c) SEM image of the sensor obtained with the secondary electron detector. (d) Monte Carlo simulations of the trajectories and depths in the silicon substrate reached by 50 electrons of 10keV and 30keV.

Main innovations and advantages

- It is possible to obtain images with chemical contrast in an SEM.
- It is manufactured using standard technologies, is very compact in size, does not require the use of electromagnetic filters, and is inexpensive to manufacture.
- It allows to obtain with the sensor in integrator mode the average energy of the electrons generated in a point of the material to be analyzed.
- It allows to obtain with the sensor in counting mode an energy spectrum of the electrons at a point of the material being analyzed.
- It allows to measure the intensity or energy of the incident electron separately on the sensor.

Patent Status

Spanish patent application filed.

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