IMEM-CNR, Webinar – 20/12/2021, ore 14:30

Seminario su

CdZnTe for X- and γ-ray detectors

Manuele Bettelli
IMEM-CNR, Parma

Nowadays ionizing radiation detectors are widely employed in several application fields. These include medical imaging (CT, SPECT), environmental monitoring (control of the background radiation and contaminated areas), homeland security (cargo and luggage control) and astrophysics (study of x- and γ-ray emission from celestial bodies).

In last decades the employment of semiconductor devices is getting more and more important and they have replaced classical scintillators in various application fields. Semiconductor based detectors can achieve better energy resolution thanks to the direct conversion of incident radiation into electrical signal. In addition semiconductor materials, compared to scintillators, allow to achieve higher spatial resolution in imaging detectors. These characteristics make semiconductors the more advance technology for radiation detection of x- and γ-photons in the energy range 1 keV - 10 MeV.

Taking into account the key demands of radiation detector applications, several semiconductor materials have been studied after that year. The main requests for such materials are: I) high stopping power even for energetic radiations; II) opportunity to make spectroscopy; III) imaging capability with good spatial resolution; IV) possibility to operate at room temperature; V) excellent mechanical rigidity to fabricate compact and stable systems.

Among the compound semiconductors Cadmium Zinc Telluride (CdZnTe or simply CZT) meets the listed above demands. CdZnTe represents the best compromise in terms of energy efficiency, high atomic number, resistivity, and room temperature operation capability. Nowadays high-performance detectors with good energy resolution, high detection efficiency and room temperature operation capability can be fabricated with CZT.

CZT characteristics allow it to be employed in a number of different application fields such as: I) Environmental monitoring; II) Non-destructive testing; III) Astrophysics; IV) Medical imaging; V) Imaging.

IMEM deals with CZT for almost 20 years and currently collaborates with several Italian and international research groups and forefront companies thanks to its experience regarding: I) Crystal growth; II) Detector fabrication; III) Material and detectors characterization; IV) Simulation of detector response and spectral correction; V) Isotope identification.