

Detector for superficial nano studies by Mössbauer Spectroscopy



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Mössbauer spectroscopy consists in resonant recoil free absorption and emission of gamma rays by nuclei incorporated within a solid matrix. The method evidences discrete changes in the chemical state and/or environment of the Mössbauer nucleus. Following resonant absorption of a gamma ray, the nucleus may de-excite by emission of a gamma rays or by conversion electrons or characteristic X-rays. The conversion signal is quite high for the ^{57}Fe , ^{151}Eu and ^{119}Sn isotopes at room temperature. The most physical interesting information is obtained by means of electrons.

The penetration depth maximum of electrons is of order of 250 nm for ^{57}Fe , ^{151}Eu isotopes and 1000nm for ^{119}Sn isotope. By electron detection in backscattering geometry it is possible to effect superficial studies in nano range.

We constructed a versatile flow-gas proportional counter for Mössbauer Spectroscopy, suitable for surface studies with the ^{57}Fe , ^{119}Sn and ^{151}Eu isotopes in the nano range.



Detector lateral view



Detector top view

Main characteristics:

- Outer dimensions: height 61 to 98 mm, width: 80 mm diameter,
- Detection volume can be changed in large limits: diameter 40 mm; height 1 to 38 mm,
- Flow gas: 94% He + 6% CH₄ or 99% He + 1% C₄H₁₀,
- Flow gas rate: 50 to 1000 cm³/hour,
- High voltage: 700 to 1100 V,
- Maximum diameter of the sample: 21 mm,
- Sample holder allows simultaneously surface and transmission measurements,
- It is possible to make also measurements by X-ray or gamma ray with this detector.