

Measurement of the internal magnetic field by Mössbauer spectrometry

Slovak University of Technology in Bratislava, Exercise STU-06

Main topic: Non-destructive material testing

Keywords: Mössbauer effect, material testing, non-destructive analysis, magnetic hyperfine structures, Mössbauer spectroscopy

Purpose: The objective of the experiment is to demonstrate the recoilless nuclear resonance fluorescence known as the Mössbauer effect. Based on the Mössbauer effect, it is possible to measure weak interaction between atomic nuclei and electrons. Although, the Mössbauer effect is constrained to atomic nuclei bound in a solid material it allows to investigate properties of magnetic materials as well as superparamagnetic particles and magnetism of amorphous materials.

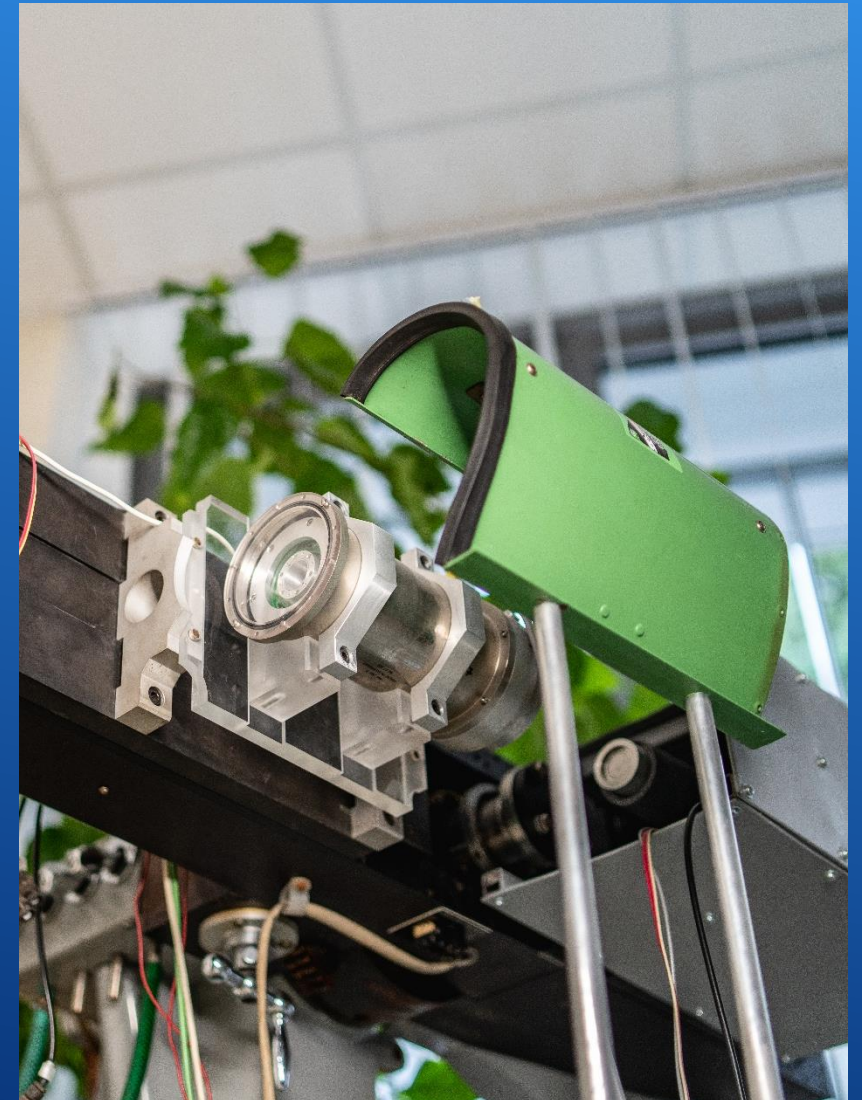
Level of exercise: Basic Advanced Complex
Level of education: BSc MSc PhD

What you will learn:

The students will learn the main principles of a magnetic hyperfine structure, isometric shift and quadrupole splitting, will understand the basic principles of Mössbauer spectroscopy and its application in solid-state physics and chemistry.

Important information:

- Minimal size of student group: 2
- Maximal size of student group: 4
- Overall duration of the experiment (in wall clock hours): 2



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Possibility to perform experiment on demand: Yes No

Frequency of occurrence: 2-3 times per year

Examination modalities: report

Teaching languages: English, Slovak

Pre-knowledge required: Knowledge of types, sources and interaction of radiation with matter, knowledge of detector types, MCA/MCS measurement modes and evaluation of uncertainties

Instruments required for exercise:

- Mössbauer source
- Mössbauer spectrometer

Execution:

- For a given source and absorber, the intensity of absorption as a function of the energy is measured
- Modulation of the emission energy is achieved by using the Doppler effect To record Mössbauer spectrum the multichannel analyser is operated differently.
- The channels are successively opened by the digital function generator and continuous switching of the channels is synchronized by trigger pulses of the function generator.
- Mössbauer spectrum consists of counting pulses versus the channel number
- Based on measured Mössbauer spectrum, principal parameters of the nuclei magnetic hyperfine structure are calculated

Limitations:

Pregnant and breastfeeding women are not allowed to enter the controlled radiation area. Legal age (18) is required.

Fore more information on precoders please visit <http://www.ujfi.fei.stuba.sk/kontakt.php>

