Fast neutron flux density mapping

TU Wien, Exercise TUW-04

Main topic: Reactor Physics

Keywords: β-detector, activity, fast neutron flux, neutron activation, neutron detector

Purpose:
This experiment provides all participants with the theoretical and practical differences between thermal and fast neutron flux measurements in the reactor core. The students will become familiar with neutron activation and gain experience in handling irradiated samples and short-lived radioisotopes. They will also learn how to use an appropriate counter system to measure the produced activity of the radioactive isotopes.

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

What you will learn:
During this experiment the participants will learn the theoretical and practical difference between thermal and fast neutron flux measurements.

Important information:
- Minimal size of student group: 4
- Maximal size of student group: 8
- Overall duration of the experiment (in wall clock hours): 3

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Possibility to perform experiment on demand: ☒Yes ☐ No
Frequency of occurrence: Once a year
Examination modalities: Participation in the experiment, protocol and final written test
Teaching languages: English/German

Pre-knowledge required:
understanding in nuclear and reactor physics, radiation physics and protection, theory of neutron detectors.

Instruments required for exercise:
- Reactor I&C system;
- A 2π counter to measure the foil activity;
- A contamination monitor.

Execution:
- For this experiment Iron is selected as sample material for irradiation in the reactor.
- the Iron foils are irradiated bared and within a cadmium cover.
- After irradiation the samples are left to cool for an appropriate decay time.
- The samples are extracted and the activity measured in the 2π β-detector.

Limitations:
This experiment will be conducted in a controlled radiation area. Hence. controlled radiation area limitations apply.