

# Neutrons: benefits and disadvantages. Materials under neutron irradiation

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The driving force and the main goal of fusion research is to construct a power generating system based on the energy output of nuclear reactions between hydrogen isotopes. From the Deuterium – tritium fusion ( $d + t \rightarrow n + \alpha + 17.6 \text{ MeV}$ ) is best possible option when the energy balance is considered. However, it also brings a set of serious technological challenges related to neutrons. They are energy carriers and are indispensable in tritium production, but they cause serious modification of structural materials. The aim of this lecture is to give an introduction to issues related to tritium breeding and to the radiation damage and transmutation of structural materials.

## Outline

1. Fusion reactions and their relevance to controlled nuclear fusion
2. Tritium breeding: blanket and functional materials
3. Neutron impact on materials
  - a. *Radiation damage*
  - b. *Transmutation*
4. Work with contaminated materials
5. Impact on diagnostics: optical components, cables, bolometers.
6. Simulation of neutron impact on first mirror.