

On-The-Fly Cross Sections Generation in Neutron Transport with Wide Energy Region

Authors : Rui Chen, Shu-min Zhou, Xiong-jie Zhang, Ren-bo Wang, Fan Huang, Bin Tang

Abstract : During the temperature changes in reactor core, the nuclide cross section in reactor can vary with temperature, which eventually causes the changes of reactivity. To simulate the interaction between incident neutron and various materials at different temperatures on the nose, it is necessary to generate all the relevant reaction temperature-dependent cross section. Traditionally, the real time cross section generation method is used to avoid storing huge data but contains severe problems of low efficiency and adaptability for narrow energy region. Focused on the research on multi-temperature cross sections generation in real time during in neutron transport, this paper investigated the on-the-fly cross section generation method for resolved resonance region, thermal region and unresolved resonance region, and proposed the real time multi-temperature cross sections generation method based on double-exponential formula for resolved resonance region, as well as the Neville interpolation for thermal and unresolved resonance region. To prove the correctness and validity of multi-temperature cross sections generation based on wide energy region of incident neutron, the proposed method was applied in critical safety benchmark tests, which showed the capability for application in reactor multi-physical coupling simulation.

Keywords : cross section, neutron transport, numerical simulation, on-the-fly

Conference Title : ICNRE 2018 : International Conference on Nuclear and Radiation Engineering

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2018