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技术及应用

启明星1#实验装置k_s、k_{eff}和φ^*的模拟计算

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摘要 用MCNP程序对启明星1#实验装置（Venus 1#）的k_s、k_{eff}和φ^*进行模拟计算。在装置的源区、快区、反射层、屏蔽层已定条件下，逐层增加热区燃料元件，每增加1层，对k_s、k_{eff}和φ^*进行1次计算，共增加了13层，最终得到k_{eff}为0.962 46，满足了Venus 1#的设计要求。元件层数增加，φ^*先增后降，当增至12层时，φ^*又明显增大。外源位置和能量对φ^*有影响，外源在轴向离中心越近、能量越高，φ^*越大。

关键词 启明星1#实验装置 MCNP程序 有源次临界中子有效增殖因子 有效增殖系数 外源中子平均价值

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Simulating Calculation of Parameters k_s, k_{eff} and φ^*

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Abstract The source sub-critical effective multiplication factor (k_s), effective multiplication factor (k_{eff}) and external source neutron worth (φ^*) of Venus 1# were calculated by MCNP code. When the neutron source zone, the fast neutron spectrum zone, the reflecting zone and the shielding zone is kept constant and the fuel rods in the thermal neutron spectrum zone are added layer by layer, k_s, k_{eff} and φ^* are calculated, respectively. The k_{eff} is 0.962 46 at 13 added layers, and it meets the design request of Venus 1#. When the fuel rods are added layer by layer, $\varphi$is increased and then decreased. The φ^* is increased obviously at the 12th layer of fuel rods. In addition, the research results show that the closer the source position to the center of the assembly axially and the higher the energy of the source neutron, the greater φ^* would be.

Key words Venus 1# MCNP code k_s k_{eff} φ^*

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