原子能科学技术 2007 41 (1): 1-10 ISSN: 1000-6931 CN: 11-2044/TL

快报

$E_p \leq 200$ MeV能区p+^{58}Ni反应的计算与分析

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收稿日期 2005-8-2 修回日期 2006-3-2 网络版发布日期: 2007-1-25

摘要 以现有质子诱发^{58}Ni的各种核反应截面、能谱、双微分截面、弹性散射角分布等实验数据为基础，利用自行研制的大型核模型计算程序MEND计算质子能量在200 MeV能区内^{58}Ni(p, *x*)反应的截面、能谱、角分布和n、p、α、d、t、^{3}He 6种出射轻粒子的双微分截面。MEND程序的理论框架基于球形光学模型、核子的核内级联发射模型、以激子模型为基础的预平衡发射理论、蒸发模型和带宽度涨落修正的Hauser Feshbach统计理论。光学模型中的势参数由APMN程序通过符合p+^{58}Ni反应的去弹截面和弹性散射角分布获得。出射粒子的双微分截面则利用MEND程序输出的能谱再通过Kalbach系统学公式计算。将计算结果与实验数据及ENDF/B6评价库进行了比较，计算结果与实验数据基本一致，与ENDF/B6相比，增加了^{3}He的计算，且将能区上推至200 MeV。

关键词

^{58}Ni靶核 质子诱发反应 截面 能谱 双微分截面

分类号 0571.4

Calculation and Analysis of ^{58}Ni(p,*x*) Reaction in Energy Region $E_p \leq 200$ MeV

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Abstract Based on the nuclear reaction models and the experimental data of proton reaction cross sections, energy spectra and elastic scattering angular distributions of ^{58}Ni, all kinds of cross sections, energy spectra, and the double differential cross sections of neutrons, protons, alpha, deuterons, tritons and helium emissions are calculated and analyzed for ^{58}Ni(p, x) reaction at incident proton energies below 200 MeV with the large calculation code MEND developed previously by the authors. The theoretical frames of MEND are spherical optical model, intranuclear cascade model, pre equilibrium emission theory based on exciton model, evaporation model and Hauser Feshbach statistical theory with width fluctuation correction. The optical potential parameters are searched automatically with the code APMN to fit the experimental data of reaction cross sections and elastic scattering angular distributions of p+ ^{58}Ni reaction. Based on the energy spectra results calculated with the code MEND and the Kalbach systematic formula e, the double differential cross sections of particle emission are obtained. Theoretical calculation results are compared with existing experimental data and with the results of the evaluated ENDF/B6 file. As a whole, theoretical calculation results agree with the experimental data. Compared with the ENDF/B6 file, calculations of ^{3}He are considered and the energy region is extended up to 200 MeV.

Key words ^{58}Ni target proton induced reaction cross section energy spectra double differential cross section

DOI

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