Semi-Empirical Formulas of Nuclear Excitation Functions for (n, p) Reactions at the Neutron Energy Range $12 \le E_n \le 21$ MeV and Target Mass Number Range $30 \le A \le 128$

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A new semi-empirical systematics of (n, p) reaction excitation functions for nuclei with mass number $30 \le A \le 128$ at neutron induced energy range $12 \le E_n \le 21$ MeV is obtained. It is based on the evaporation model and the pre-equilibrium exciton model. The Droplet model of Myers and Swiatecki was used to describe the reaction energy Q. The Dostrovsky formula was introduced to formulate the expression of the inverse cross section channel.

By fitting these formulae to the existing cross-section data, the adjustable free parameters have been carried out and the systematics of the (n, p) reaction have been studied.

The excitation functions were calculated and compared with the experimental data from the EXFOR library and compared to the results made with the Talys 1.6 Code. A good agreement between excitation functions systematics, the experimental data and the Talys 1.6 Code results was observed for all the studied (n, p) nuclear reaction.