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Modeling of channeling of deuterons in titanium deuteride

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The channeling phenomena were modeled using the supplementary Geant4 library TPT-EM. In the model the incident deuterons were captured in the crystallographic channel by Ti-plane potentials. The height of the plane potential has been calculated according to the Linhard theory. The experimental effect of the 20 percent neutron yield enhancement in the energy range 7-12 keV was fit by the model with $\chi^2/\text{ns} = 0.83$. In future we plan to develop a special TPT-EM multiple scattering process for low energy ions, which takes into account modification of projectile flux in the crystallographic channel.

Summary

Simulation of channeling of low energy deuterons in a single TiD_2 crystal is presented. When deuterons are moving in the (001) crystallographic axis, the dd neutron yield increases due to the deuteron energy loss decrease and concentration of the deuteron flux along the target-deuterons chain. The effects increase effective thickness and effective density of the deuteron target.

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