

NITINS (26, 27)

Nuclear Processes due to the Interaction
of the Neutron with the Electron

Any sort of short range interaction between the neutron and the electron¹⁾ will give rise to following processes, when the neutron ^{will} pass ~~is~~ through matter.

a) Processes which are independent of the internal structure of the nucleus.

i) Inelastic scattering by the free electron. Condon²⁾ found the cross section to have the order of magnitude

$$\sigma \sim \kappa^2 \times 10^{-32} \text{ cm}^2,$$

assuming the potential energy to have a value ^{κmc^2} for the distance smaller than e^2/mc^2 .

ii) Inelastic scattering of ~~the~~ the fast neutron with the emission of the electron from the K-level.

$$\sigma \sim \kappa^2 \times \left(\frac{Z}{80}\right)^3 \times 10^{-33} \text{ cm}^2.$$

iii) Inelastic scattering of the fast neutron with the creation of the pair of electrons. The cross section will have the same order of magnitude as that of ii). The ratio will be larger as Z and the neutron energy increase.

iv) Elastic scattering of the slow neutron by orbital electrons. According

1) One type of interaction was suggested by Gamow and Teller (Phys. Rev. **51**, 289, 1937) as an extension of the β -transformation theory.

2) Condon, Phys. Rev. **49**, 459, 1936.

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to Condon,²⁾ the restriction $\kappa < 30$ is necessary in order to account for the experimental results. This makes the occurrence of all the processes i), ii) and iii) too rare to be observable.

b) Proper nuclear processes.

i) Emission of the electron from the K-level at the same time with the ~~transition~~ transition of the nucleus excited by the fast neutron. This process can not be distinguished from the ordinary internal conversion. The relative importance will depend on the magnitude of κ as well as the structure of the nucleus concerned.

ii) Emission of the pair by the similar nuclear transition⁵⁾. This also can not be distinguished from the internal pair creation.

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