

(83) Cross Sections of Capture of Neutrons A02²
E29 011 A02

$$V_{12} = \frac{e^2}{2\pi c} \iint \frac{\Psi_1(\vec{r}_1) \Psi_2(\vec{r}_2)}{|\vec{r}_1 - \vec{r}_2|} \Psi_1^* \Psi_2^* d\vec{r}_1 d\vec{r}_2$$

$$|V_{12}|^2 = \frac{e^4}{4\pi^2 c^2} \iint \frac{e^2}{|\vec{r}_1 - \vec{r}_2|} \Psi_1^* \Psi_2^* \Psi_1 \Psi_2 d\vec{r}_1 d\vec{r}_2$$

$$= \frac{4\pi^2 e^4}{8 M^2 c^2} \iint \Psi_1^* (\mu_n \vec{\sigma}_n + \mu_p \vec{\sigma}_p) \Psi_2 d\vec{r}_1 d\vec{r}_2$$

$$= \frac{1}{2} \{ \alpha(1) \beta(2) - \alpha(2) \beta(1) \} (\mu_n \vec{\sigma}_n + \mu_p \vec{\sigma}_p)$$

$$\frac{1}{2} \{ \alpha(1) \beta(2) + \alpha(2) \beta(1) \}$$

$\mu_n \sigma$
 = 0 場合、 \vec{r}_1 と \vec{r}_2 間の $\vec{r}_1 - \vec{r}_2$

$|V_{12}|^2$

neutrons's 2 方向 σ

$$(\mu_n - \mu_p) (\alpha(1) \beta(2) - \alpha(2) \beta(1))$$

$$= \frac{1}{2} \{ \alpha(1) \beta(2) - \alpha(2) \beta(1) \} \{ \mu_n \alpha(1) \beta(2) - \mu_n \alpha(2) \beta(1) \}$$

$$- \mu_p \alpha(1) \beta(2) + \mu_p \alpha(2) \beta(1) \}$$

for $\sigma_n = 1, -1; \sigma_p = 1, -1$ using sum up for

$$= \frac{1}{2} \{ (\mu_n - \mu_p) (\alpha(1) \beta(2) + \alpha(2) \beta(1)) \}$$

$$\{ \mu_n \alpha(1) \beta(2) + \mu_p \alpha(1) \beta(2) \}$$

$$= \mu_n - \mu_p$$

$$|V_{12}|^2 = \frac{1}{2} (\mu_p - \mu_n)^2 \cdot \frac{4\pi^2 e^4}{M^2 c^2} \iint \Psi_1^* (\vec{r}_1, \vec{r}_2) \Psi_2 (\vec{r}_1, \vec{r}_2) d\vec{r}_1 d\vec{r}_2$$

$\frac{4\pi V}{(2\pi)^3}$

Fermi

$$\sigma_C = \frac{64\pi^4 k^3 v^3}{M^2 c^2 v^2} \left(\frac{eR}{2Mc}\right)^2 (q_n - \mu_p)^2 \int |^2 \times R^2$$

$$= \frac{64\pi^4 \pi^5 k^3 v^3 e^2}{M^2 c^2 v^2} (\mu_n - \mu_p)^2 \int |^2 \times R^2$$

$$\sigma_C = \frac{2\pi}{\hbar} \frac{64\pi^4 M^2 v^3}{8\pi^4 c^2} \frac{8\pi^2 v^2}{k} \times \frac{4v^2}{\hbar c^3 v}$$

$$\times \frac{4\pi^2 v k^3 e^2}{8 M^2 c^2} \times \int |^2 \times (\mu_n - \mu_p)^2$$

$$= \frac{32\pi^4 \pi^3 k^3 v^3 e^2}{M^2 c^5 v} \times (\mu_n - \mu_p)^2 \times \int |^2$$

$$(4\pi)^2 \int \left(\frac{\sin(\frac{k r + \delta_0}{2})}{\frac{k r}{2}} - \alpha r \right)^2 r^2 dr$$

$$= 4\pi^2 \left(\frac{\alpha}{2\pi}\right)^2 \left(\frac{2}{k}\right)^2 (4\pi^2 \pi)^2 \left(\frac{\alpha - \beta}{(\alpha + \beta)(\rho + \beta)^2}\right)^2$$

$$= \frac{8\pi^4 \alpha^4 (\alpha - \beta)^2}{(\alpha + \beta)^2 (\rho + k)^2}$$

~~$\frac{32\pi^4 \pi^3 e^2}{M^2 c^5} \left(\frac{2}{k}\right)^2$~~

$$\sigma_C = \frac{32\pi^4 \pi^3 k^3 v^3 e^2}{M^2 c^5} \cdot 4\pi = \frac{4\pi^2 \pi^3 v^3 e^2}{M^2 c^5} \propto \frac{R^2}{k^2}$$

$$= \pi \frac{e^2}{M^2 c^2} \frac{k}{Mc} \left(\frac{2W}{E}\right)^{\frac{1}{2}} (\mu_p - \mu_n)^2 \frac{(W^2 - W'^2)(W + \frac{E}{2})}{(W' + \frac{E}{2}) \cdot Mc^2}$$