\(\alpha\) substructures in light and heavy nuclei

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The inclusive \((p, \alpha x)\) reaction has attracted considerable interest in connection with pre-equilibrium theories of nuclear reactions. In paper [1] for the first time the excitation of internal degrees of bounded \(\alpha\)-particles was observed. It was shown that the enhancements of \((p, \alpha x)\) Cross section in the range of 20 MeV of excitation energy are due to two step reactions

\[
p + T \rightarrow \alpha + (\alpha^* + ^8Be)
\]

\[
\rightarrow \alpha + X + \cdots
\]

\((T\) denotes target nuclei: \(^{12}C, ^{16}O, ^{24}Mg\)). In paper [2] the \(\alpha\) substructures in heavy nuclei (rare-Earth nuclei) were investigated with the help of \((e^- \alpha \nu)\) reactions.

It was shown that the comparison of the values of the cross sections

\[
\left(\frac{d^2\sigma}{d\Omega dF_\alpha}\right)_{e^-\alpha} \quad \text{for} \quad (e^-, \alpha \nu) \quad \text{reactions}
\]

and

\[
\left(\frac{d^2\sigma}{d\Omega dF_\alpha}\right)_{n,\alpha} \quad \text{for} \quad (n, \alpha) \quad \text{reactions}
\]

allows the calculations of the mass of the intermediate boson \(W\). From experimental data the value \(m_w \sim 80m_p\) is obtained.

References
