

Compositional analysis and production of polyethylene targets for the proton charge radius measurements through the electron-proton elastic scattering

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Proton charge radius puzzle is a big problem that the size of protons measured by electron scattering and hydrogen spectroscopy is different from the size of protons measured by μ hydrogen spectroscopy. To solve this problem, we are going to perform proton charge radius measurement by electron-proton elastic scattering using a low energy electron linear accelerator at ELPH, Tohoku University. This experiment requires ^{12}C -enriched polyethylene target with $100\mu\text{m}$ thickness and of which carbon-to-hydrogen composition ratio is known with 0.1% accuracy. However, it is difficult to obtain ^{12}C -enriched polyethylene powder. First, we improved our method how to produce polyethylene target sheets using FLO-THENE (Sumitomo Seika Chemicals Co., Ltd.), general polyethylene powder. In addition to that we did composition analysis of that powder. In CHN (Carbon-Hydrogen-Nitrogen) elemental analysis, the composition ratios of C and H were measured with an accuracy of 0.1%. And measurements of the degree of crystallinity of polyethylene sheets using a Fourier Transform InfraRed spectrometer (FTIR) were performed. The production of polyethylene target sheets was performed using two types of jigs with different heating and pressing methods. The uniformity of thickness had not been good enough, however, it was improved using a roller. We will report on the results of composition analysis and the current status of target production.

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