

The Contribution of Shell Correction of Targets $^{27}_{13}\text{Al}$, $^{63}_{29}\text{Cu}$, $^{197}_{79}\text{Au}$ in the Calculation of Stopping Power of Charged Particles ^1H , ^4He , ^7Li , ^{12}C , ^{16}O for Speeds $V \geq V_0 Z_1^{2/3}$

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Abstract : The modified Bethe-Bloch formula depends on several corrective terms; the most important of these is undoubtedly the shell correction, especially for energies of a few MeV/u and whose contribution can exceed 10% of the stopping power. The charge state of the incident ions also influences this latter, particularly heavy ions at intermediate speeds $2Z_1 V_0 \geq V \geq V_0 Z_1^{2/3}$. In the present work, we calculated the shell corrections of the targets $^{27}_{13}\text{Al}$, $^{63}_{29}\text{Cu}$, $^{197}_{79}\text{Au}$, the effective charge and the stopping power of the ^1H , ^4He , ^7Li , ^{12}C , ^{16}O ions by using the Bethe-Bloch formula at energies ranging from 1 to 100 MeV/u. The stopping power values of the ^1H , ^4He , ^7Li , ^{12}C , ^{16}O ions in the targets $^{27}_{13}\text{Al}$, $^{63}_{29}\text{Cu}$, $^{197}_{79}\text{Au}$ were compared to those generated by the SRIM-2013, PSTAR, ASTAR, and MSTAR calculation codes. In this study, we found that the contribution of the shell corrections could reach 13% of stopping power, especially for medium and heavy targets at energies of a few MeV/u.

Keywords : shell correction, stopping power, modified Bethe-Bloch formula, $V \geq V_0 Z_1^{2/3}$, ^1H , ^4He , ^7Li , ^{12}C , ^{16}O , $^{27}_{13}\text{Al}$, $^{63}_{29}\text{Cu}$, $^{197}_{79}\text{Au}$

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