

Stopping power of ions in matter: current status of experimental data and theoretical description

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Stopping powers are relevant to a wide range of applications, such as ion beam analysis, deposition ranges, ion implantation, and radiation damage, to name a few. Reliable values of stopping powers are also needed in isotope production for medical applications, in fusion technologies and detector development.

In this work we present the state of the art of the stopping power of ions in matter. We give an overview of our present knowledge, and discuss the areas of strength and weaknesses and where data is lacking, on the basis of the comprehensive experimental stopping power database of the International Atomic Energy Agency (IAEA) [1, 2].

The field of stopping powers in matter is evolving with new trends in materials of interest, including oxides, polymers, and biological targets [3, 4]. An example for different ions in Mylar is displayed in Figure 1. Our goal is to identify areas of interest and emerging data needs to meet the requirements of a continuously developing user community.

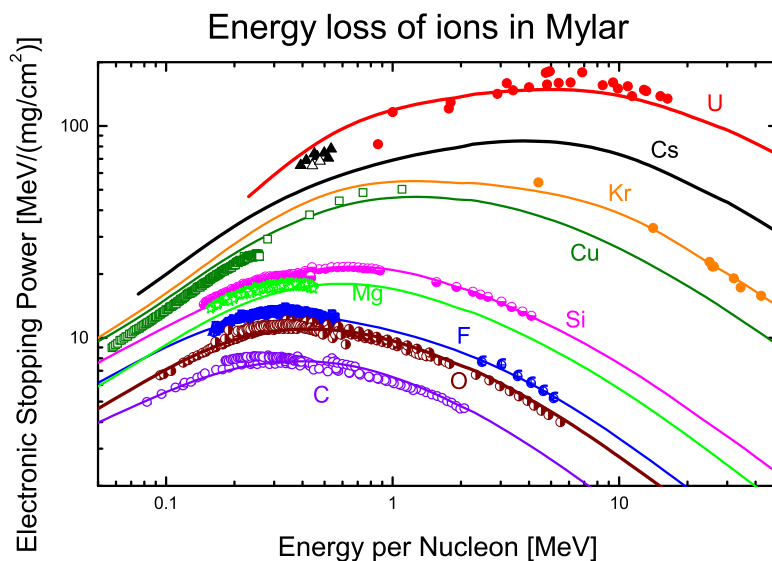


Figure 1: Stopping cross section of ions in Mylar compared with SRIM results [5] (lines). Experimental data (symbols) are from [1]; black triangles are recent data for Cs fragments reported in [3].

- (1) IAEA Stopping Database. Electronic Stopping Power of Matter for Ions: Graphs, Data, Comments and Programs, Available at <https://www-nds.iaea.org/stopping/> (last update: 2021).

- (2) Montanari, C.; Dimitriou, P. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* **2017**, *408*, Proceedings of the 18th International Conference on the Physics of Highly Charged Ions (HCI-2016), Kielce, Poland, 11-16 September 2016, 50–55.
- (3) Materna, T.; Berthoumieux, E.; Deshayes, Q.; Doré, D.; Kebbiri, M.; Letourneau, A.; Thulliez, L.; Kim, Y.; Köster, U.; Ledoux, X. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* **2021**, *505*, 1–16.
- (4) Provenzano, L.; Rodriguez, L. M.; Fregenal, D.; Bernardi, G.; Olivares, C.; Altieri, S.; Bortolussi, S.; González, S. J. *Journal of Physics: Conference Series* **2015**, *583*, 012047.
- (5) Ziegler, J. SRIM. The Stopping and Range of Ions in Matter, Available at <http://www.srim.org/> (last update: **2013**).