

§33. Establishment of Atomic and Molecular Data Application Forum

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Recent fast, significant and remarkable advancement we have witnessed in past decades in areas such as high-tech. industries, medical research, environmental science, atmospheric science, fusion sciences as well as other basic sciences including astrophysics and radiation physics and chemistry fully depend on extensive utilization of atomic and molecular (A&M) data for structures and dynamical processes not only for basic understanding of various phenomena, but also establishing guiding new key principles and basic technologies based on simulations with this accurate and complete A&M data basis. Without this A&M data basis, such an impressive progress of our technologies and basic understandings of nature would not have been realized. For example, NIFS A&M research group has concentrated on extensive activity of production, compilation and storage of A&M data for fusion research over more than two decades, and extensive A&M data base collected in NIFS A&M data center has been widely used by a variety of basic and applied scientists worldwide. It is now considered as one of the world intellectual properties and assets commonly shared by all human beings. National Astrophysical Observatory of Japan (NAOJ) has been concerned with collecting A&M data relevant to astrophysical and astronomical research, which includes A&M dynamical processes and also emission of light from atoms, ions and molecules for spectroscopic purposes and these data have made significant contributions to identifications of origins of various types of observed

photons. Many electronic-engineering and material researchers in universities and industries have been extremely active to establish basic A&M data bases for further development of their thin-film manufacturing, etchings and other key technologies. As have been briefly highlighted, accurate, complete and comprehensive A&M data bases have served as the most important basis for development of key technologies and sciences. But orchestrated and collaborative efforts to produce, collect, evaluate and liberalize these A&M data from a variety of sectors of science and technology have not been materialized yet.

Therefore, we undertook this collaborative effort to establish the forum as a platform connecting between A&M data producers and data users as well as among data producers and users to integrate independent and isolated effort of data production and storage so that more efficient and complete data production and transmission could become possible.

In this year, under auspice of the Institute of Electrical Engineers of Japan (IEEJ), we opened new database¹⁾ of recommended data for electron collision cross section compiled by a technical society of IEEJ. The database is accessible on-line at the NIFS A&M database server (<http://dpc.nifs.ac.jp/DB/IEEJ/>, see Fig. 1). It was conducted in a frame of developing a common platform of A&M databases in different areas of science and technologies.

Recommended data for electron collision cross section of atoms and molecules

The recommended data set was compiled by a technical society of *The Institute of Electrical Engineers of Japan* [in Japanese Report #853, Sep. 2007]. The data set was chosen so that it reproduced measurements of transport data by using a two-term Boltzmann code.

How to get data set
 Click name of atom/molecules listed below to open data files.

Atom
 He, Ne, Ar, Kr, Xe, Rb

Diatomic molecule
 CO, N₂, NO, O₂

Triatomic molecule
 CO₂

Polyatomic molecules
 CF₄, CH₄, GeH₄, SiH₄, C₂H₆, Si₂H₆

Structure of data file

For example, data file of Ar

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890621 39.948 8      dates, atomic/molecular weight, number of processes involved
elastic momentum transfer
40 0 2.746470e-005  number of data, threshold energy (eV), electron energy loss (<math>\leq 2m/M</math>) (eV)
0.000 6.300      electron energy (eV), cross section ( $10^{-18}$  cm2)
0.010 4.500      .
0.014 3.880      .
0.017 3.580      .
.
.
excitation
  
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Fig. 1

- 1) Kato, D.: Symposium "Front lines of basic parameters and applications of discharge", Annual meeting of IEEJ, Mar. 19-21, 2008, Fukuoka Inst. Tech.