§9. Atomic and Molecular Numerical Databases and Data Activities

Murakami, I., Kato, D., Kato, M., Sakaue, H.A.

We have constructed and made public atomic and molecular (AM) numerical databases for various collision processes, mainly for fusion plasma research but also for other areas such as astrophysics, applied-science with low temperature plasmas, plasma processing, etc. The AM data activities in Japan were initiated in 1970s.

The current web accessible database system[1] has been opened and maintained since 1997. The database system consists of 6 sub databases. Table 1 shows a list of AM and PWI numerical databases. For a bibliographic database "ORNL" original data records are collected by Oak Ridge National Laboratory (USA). Cross references are partly supported between bibliographic and numerical databases. Users can retrieve numerical data through the web form by element, ionic stage, initial states and other constraints.

The databases include: "AMDIS" for cross sections and rate coefficients for electron impact ionization, excitation, recombination, and dissociation; "CHART" for cross sections of heavy particle collisions; "MOL" for numerical data on molecular collision processes, "SPUTY" for numerical data on sputtering yields for mono-atomic solids and "BACKS" for numerical data on reflection coefficients.

During the 2013 fiscal year, we mainly updated the data for AMDIS, MOL and SPUTY. A list of publications which data are newly included to the database is shown as "What's new" window of the database homepage since 2012[1]. The working group for atomic and molecular compilation worked on collision processes data for light elements.

Fig.1 shows recombination rate coefficients for W ions available in literature. Tungsten data are highly required for fusion plasma study, but not many data are available yet. Fig. 2 shows sputtering yield rates. We newly included data from compilation of Eckstein[2] who compiled various available data. Sputtering data are also interested in fusion research.

Table 1. AM and PWI databases

Name	No. of Records*	Period
AMDIS	671,994	1929-2013
CHART	7,054	1940-2010
MOL	3,951	1956-2013
SPUTY	2,084	1931-2007
BACKS	396	1957-2002
ORNL	78,097	1959-2009

* as of April 14, 2014.

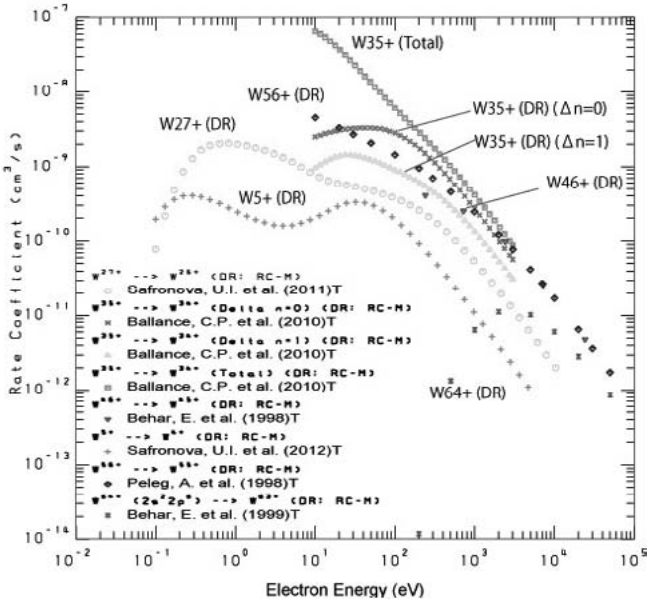

Fig. 1 Recombination rate coefficients for W ions in AMDIS-REC and there are not many data available yet.

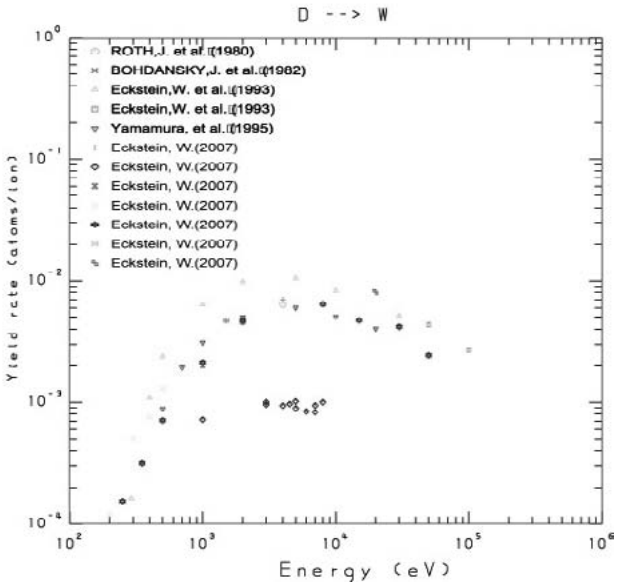

Fig. 2 Sputtering yield rates for D bombardment to W target. Newly included data are taken from compilation of Eckstein (2007)[2]: ＋(Eckstein 1993), ◇ (Finfgeld 1970), ×(Guseva 1976), ※(Guseva 1999), ✷(Ruth 1979,1980, Eckstein 1993), ⋈ (Bohdansky 1980, Eckstein 1993), ⍁ (Yonts 1969).

1) NIFS Database, http://dbshino.nifs.ac.jp/
2) Eckstein, W., "Sputtering by Particle Bombardment, Topics Appl. Physics" (R. Behrisch and W. Eckstein eds., Springer, Berlin 2007) **110**, p.21-187 (2007)