

Classification of Processes

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This work is based on the classification used in the three known online bibliographic databases in atomic and molecular physics:

1. The CFADC Database in Oak Ridge National Laboratory: <http://www-cfadc.phy.ornl.gov/bibliography/search.html>.
2. AMBDAS, the IAEA bibliographic database: <http://www-amdis.iaea.org/AMBDAS>.
3. GAPHYOR at the University of Paris-XI: <http://gaphyor.lpgp.u-psud.fr/>.

DANSE is a web search engine for bibliographical atomic and molecular data developed at LPGP, University of Paris-XI, France in collaboration with GAPHYOR and the IAEA Atomic and Molecular Data Unit. It accesses simultaneously the three above mentioned databases on collisional processes. Data are accessed through DANSE using a simplified list of processes. The codes mentioned here are for internal use and not accessible to the user.

The RECOMMENDED data column is an attempt to facilitate data exchange in Atomic and Molecular Physics and may help in the development of search engines.

Comments:

1. The classification scheme is based on a 3-letter code which is composed of a letter plus two alphanumeric symbols (letters and/or digits). The first letter is related to a general group of processes (e.g., E for electron-heavy particle interactions, H for heavy particle-heavy particle interactions, etc.) while the two others reflect a particular process (e.g., EX for excitation, IN for ionization, etc.).

2. In the tables, **A** generally stands for an arbitrary atom, ion or molecule.
3. The IAEA AMBDAS has several categories related to plasma and fusion research which are obviously heterogeneous to the AM bibliography and therefore no attempt has been made to reclassify those categories.
4. A more general word “interactions” is used throughout instead of “collisions”.
5. A new “Particle-Matter Interactions” category includes both particle-surface interaction and particle penetration processes. A separation of these two categories may be considered.
6. The transport properties are apparently not fully reflected here. Any input would be appreciated.

Categories

ORNL	IAEA	GAPHYOR	RECOMMENDED/DANSE
Heavy Particle-Heavy Particle Interactions	Heavy Particle Collisions	Atomic and Molecular Collisions	Heavy Particle-Heavy Particle Interactions
Interactions of Atomic Particles with Fields	Interactions of Atomic Particles with Fields		Photon-Particle and Field-Particle Interactions
Electron and Particle Penetration in Macroscopic Matter	Surface Interaction		Particle-Matter Interactions
Heavy Particle Interactions with Solid Surfaces	Surface Interaction		Particle-Matter Interactions
Electron-Heavy Particle Interactions	Electron Collisions	Collisions of Electrons	Electron-Heavy Particle Interactions
Photon Collisions with Electrons and Heavy Particles	Photon Collisions	Photonic Collisions	Photon-Particle and Field-Particle Interactions
Data Compilations	Data collection, bibliographic and progress report		Data Compilations
Reviews and Books			
Bibliographies	Data collection, bibliographic and progress report		Bibliography
	Structure and Spectra	Structures	Structure and Spectra
		Macroscopic Properties	
	Beam heating and fueling of plasmas		Particle-Matter Interactions
	Beam-Matter interaction		Particle-Matter Interactions
	Fusion research of general interest		
	Plasma diagnostics		
	Plasma composition, Impurities		
	Plasma heating, cooling, fueling		
	Plasma radiation and cooling		
	Plasma theory, models		

Electron-Heavy Particle Interactions

Recommended category code: **E**

SUBCATEGORY	IAEA	ORNL	GAPHYOR	DANSE	RECOMMENDED	PROCESS
General	GE	E01		none	EGN	
Angular Scattering	EG	E17	SC	EAS	EAS	
Bremsstrahlung	EB	E11	BS	EBS	EBS	$e+A \rightarrow e+A+h\nu$
Deexcitation	ED	E07	DX	EDX	EDX	$e+A^* \rightarrow e+A$
Elastic Scattering	EE	E02	EL	EEL	EEL	$e+A \rightarrow e+A$
Line Broadening, Shapes and Shifts	EL	E08		ELB	ELB	
Total Scattering	ES		SN	ETS	ETS	
Detachment	ET	E13	DT	EDT	EDT	$e+A^- \rightarrow A+2e$
Fluorescence	EU	E16	ER	EFL	EFL	
Excitation	EX	E03	EX	EEX	EEX	$e+A \rightarrow e+A^*$
Change of Excitation			XX	See EEX	See EEX	
Ionization	EZ	E05	IN	EIN	EIN	$e+A \rightarrow e+A^++e$
Multiple Ionization				See EIN	EMI	$e+A \rightarrow A^{+n}+(n+1)e$
Negative Ion Formation	EA	E09	AT	ENI	ENI	$e+A \rightarrow A^-$
Momentum Transfer		E19		EMT	EMT	
Transport CS's (momentum,...)			SM	See EMT	See EMT	
Unknown Products			PR	none	EUP	

Depolarization, Change of Polarization			DO	EDP	EDP	
Creation of an ion pair (positive-negative)			IM	EIP	EIP	$e+AB^+ \rightarrow A^-+B^-$
Recombination (general)	ER	E06	RC	ERC	ERC	$A^{+q}+e \rightarrow A^{+(q-1)}$
Radiative Recombination			RR	See ERC	ERR	$e+A^+ \rightarrow A+h\nu$
Dielectronic Recombination			RD	See ERC	ERD	$e+A^+ \rightarrow A^{**} \rightarrow A^++h\nu$
3-body Recombination			RE	See ERC	ERT	$e+e+A^+ \rightarrow A+e$
e-i-o Recombination			RO	See ERC	ERO	$e+A^++B \rightarrow A+B$
Dielectronic Capture				EDC	EDC	$e+A^+ \rightarrow A^{**}$
Dissociation	EC	E04	DS	EDS	EDS	$e+AB \rightarrow e+A+B$
Dissociative Recombination			RS	EDR	EDR	$e+AB^+ \rightarrow A+B$
Dissociative Attachment	EA		AT	EDA	EDA	$e+AB \rightarrow A+B^-$
Dissociative Excitation				EDE	EDE	$e+AB \rightarrow A^++B+e$
Dissociative Ionization				EDI	EDI	$e+AB \rightarrow A^++B+2e$

Photon-Particle and Field-Particle Interactions

Recommended Category Code: **P**

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	DANSE	RECOMMENDED	PROCESS
General				PGN	PGN	
Total Absorption, Scattering	PA	H02		PTS	PTS	
Photodissociation	PD	H05	DS	PDS	PDS	$h\nu+AB \rightarrow A+B$
Elastic Scattering	PE	H03		PES	PES	$h\nu+A \rightarrow h\nu+A$
Multiphoton Absorption (excitation and ionization)	PM			PMA	PMA	$n h\nu+A \rightarrow A^*(A^+)$
Photodetachment	PT	H07	DT	PDT	PDT	$A+B \rightarrow AB+h\nu$
Fluorescence	PU	H08		PFL	PFL	
Photoexcitation	PX	H04	EX	PEX	PEX	$h\nu+A \rightarrow A^*$
Photoionization	PZ	H06	IN	PIN	PIN	$h\nu+A \rightarrow A^++e$
Free-Free Absorption or Inverse Bremsstrahlung	FF	H11	FF	PFF	PFF	$h\nu+e+A \rightarrow e+A$
Effective Absorption, Total Diffusion			SN	PEA	PEA	
True Absorption			AN	PTA	PTA	
Angular Diffusion (scattering)			SC	PAD	PAD	
Elastic Diffusion (Thomson, Rayleigh)			EL	PED	PED	
Depolarization, Change of Polarization			DO			
Non-linear Effects			NL	PNL	PNL	
Emission of Line			ER			

Change of Excitation			XX			
Zeeman Effect				PZE	PZE	
Stark Effect				PSE	PSE	
General Electromagnetic Field				PGF	PGF	
Interaction with Time-Varying Fields				PTF	PTF	
Creation of an Ion Pair (positive-negative)			IM			

Heavy Particle-Heavy Particle Interactions

Recommended Category Code: **H**

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	DANSE	RECOMMENDED	PROCESS
General		A01			HGN	
Association	HA	A15	AS	HAS	HAS	$A+B \rightarrow AB$
Line Broadening, Shapes and Shifts	HB	A12		HLB	HLB	
Dissociation	HC	A04	DS	HDS	HDS	$A+BC \rightarrow A+B+C$
Deexcitation	HD	A11	DX	HDX	HDX	$A^*+B \rightarrow A+B$
Elastic Scattering	HE	A02	EL	HES	HES	$A+B \rightarrow A+B$
Charge Transfer	HF	A06	CX	HCX	HCX	$A^++B \rightarrow A+B^+$ $A^-+B \rightarrow A+B^-$
Unknown Products					HUP	
Angular Scattering	HG	A18	SC	HAS	HAS	
Interchange Reactions	HI	A14	IR	HIR	HIR	$A+BC \rightarrow AB+C$
Inelastic Energy Losses	HL			HEL	HEL	
Energy Transfer	HN	A10		HET	HET	
Interaction Potentials	HP	A17		HIP	HIP	
Recombination	HR	A09	RI	HRC	HRC	
Total Scattering	HS			HTS	HTS	
Detachment	HT	A16	DT	HDT	HDT	$A+B^- \rightarrow A+e$
Fluorescence	HU	A05		HFL	HFL	
Excitation	HX	A03	EX	HEX	HEX	$A+B \rightarrow A^*+B$

Ionization	HZ	A07	IN	HIN	HIN	$A+B \rightarrow A+B^+e$
Penning Ionization				HPN	HPN	$A^++B \rightarrow A+B^+e$
Stripping (of projectile)		A08	SR	HST	HST	$A+B \rightarrow A^++B+e$
Attenuation		A20		HAT	HAT	
Excitation Transfer			TE	HXT	HXT	$A^++B \rightarrow A+B^*$
Associative Interchange Reactions			IA	HAI	HAI	
Dissociative Interchange Reactions			ID	HDI	HDI	
Dissociative Charge Transfer			XD	HDC	HDC	$A^++BC \rightarrow A+B^++C$
Mutual Ion-Ion Neutralization				HMN	HMN	$A^++B^- \rightarrow A+B$

Structure and Spectra

Recommended Category Code: S

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	RECOMMENDED	DANSE
General				SGN	none
Line Broadening, Shapes and Shifts	B	B01 E08 A12		SLS	SLS
Interatomic Potentials	I			SIA	SIA
Polarizabilities, Electric Moments	P		PE	SPM	SPM
Energy Levels and Wavelengths	S		EN	SEW	SEW
Transition Probabilities and Oscillator Strengths	T		TR	STP	STP
Potential Curves and Structure of Molecules		A17	VR	SSM	SSM
Dynamic Polarizability			PF	SDP	SDP
Infrared Spectra				SIR	SIR
Visible Spectra				SVS	SVS
UV/VUV/XUV Spectra				SUV	SUV
X-Ray Spectra				SXR	SXR
Rotational Spectra				SRS	SRS
Vibrational Spectra				SVB	SVB
Autoionization			IN	SAI	SAI
Autodetachment			DT	SAD	SAD
Autodissociation			DS	SDS	SDS
Dipolar Moments			DP		

Multipolar Moments			NP		
Magnetic Moments				SMM	SMM
Hyperfine Structure				SHF	SHF
Isoelectronic Sequences				SIE	SIE
Forbidden Transitions				SFT	SFT
QED Effects				SQE	SQE
Relaxation Processes				SRP	SRP
Ionization Potentials				SIP	SIP
Rydberg States				SRY	SRY
Energy of Isomerization			EI		

Particle-Matter Interactions

Recommended Category Code: **M**

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	RECOMMENDED	DANSE
General				MGN	none
Accomodation	AC			MAC	MAC
Adsorption	AD		AD	MAD	MAD
Chemical Reactions	CR			MCR	none
Desorption	DE		DG	MDE	MDE
Surface Interactions	GM			none	none
Reemission	RE			MRE	MRE
Reflection	RF			MRF	MRF
Surface Damage	SD			MSD	MSD
Secondary Electron Emission	SE	D04	EE	MSE	MSE
Radiation Induced by Particle Impact on Surfaces		D12		MIR	MIR
Neutralization, Ionization, Dissociation	SI			MNE	MNE
Sputtering	SP		SP	MSP	MSP
Radiation-Enhanced Sublimation				MRS	MRS
Trapping, Detrapping	TD			MTD	MTD
Photoelectric Ejection of Electrons			EE	MPE	MPE
Energy Loss and Stopping Power		C02	SP	MEL	MEL
Particle Range		C04		MPR	MPR
Multiple Scattering		C05		MMS	MMS
Charge State Population		C06		MCP	MCP

Excited State Population		C07		MEP	MEP
Reflection of Heavy Particles from Surfaces				MRH	MRH
Reflection of Electrons from Surfaces		D07		MRL	MRL

Data Compilations

Recommended Category Code: **D**

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	RECOMMENDED
General				DGN
Electron-Heavy Particle Interactions		J02		DEH
Heavy Particle-Heavy Particle Interactions		J03		DHH
Photon-Particle and Field-Particle Interactions		J01		DPF
Structure and Spectra		J04		DSS
Transport Properties		J05		DTP
Particle-Matter Interactions		J06		DPM

Bibliography

Recommended Category Code: **B**

SUBCATEGORIES	IAEA	ORNL	GAPHYOR	RECOMMENDED
General				BGN
Electron-Heavy Particle Interactions		L02		BEH
Heavy Particle-Heavy Particle Interactions		L03		BHH
Photon-Particle and Field-Particle Interactions		L01		BPF
Structure and Spectra		L04		BSS
Transport Properties		L05		BTP
Particle-Matter Interactions		L06		BPM