

## **12.5 Applications**

### **12.5.1 Ion / molecule reactions**

#### **Collisional activation, collisionally activated dissociation**

An ion/neutral species process wherein excitation of a projectile ion of high translational energy is brought about by the same mechanism as in *collision-induced dissociation*.

#### **Collisional excitation**

An ion/neutral species process wherein there is an increase in the reactant ion's internal energy at the expense of the translational energy of either (or both) of the reactant species.

#### **Collision-induced dissociation**

An ion/neutral species interaction wherein the projectile ion is dissociated as a result of interaction with a target neutral species. This is brought about by conversion of part of the translation energy of the ion to internal energy in the ion during collision.

#### **Elastic scattering**

An ion/neutral species interaction in which the direction of motion is changed but there is no change in the total translational energy of the collision partners.

#### **Impact parameter**

The distance of closest approach of two particles if they had continued in their original direction of motion at their original speed.

#### **Inelastic scattering**

An ion/neutral species interaction wherein the direction of motion of the ion is changed and the total translational and/or internal energy of the collision partners are also changed.

#### **Interaction distance**

The farthest distance of approach of two particles at which it is discernable that they will not pass at the impact parameter.

### **Ion energy loss spectra**

Spectra that show the loss of translational energy of ions involved in ion/neutral species reactions.

### Collisions

#### **Elastic collision**

A collision resulting in elastic scattering.

#### **Inelastic collision**

A collision resulting in *inelastic scattering*.

#### **Ionizing collision**

An ion/neutral species interaction in which an electron or electrons are stripped from the ion and/or neutral species in the collision. Generally this is used to describe collisions of fast-moving ions with a neutral species in which the latter is ionised with no change in the number of charges carried by the ion.

#### **Superelastic collision**

A collision in which the translational energy of the fast-moving collision partner is increased.

### Reactions

#### **Association reaction**

The reaction of a (slow-moving) ion with a neutral species in which the reactants combine to form a single ionized species.

#### **$\alpha$ - cleavage**

Fission of a bond originating at an atom which is adjacent to the one assumed to bear the charge; the definition of  $\beta$  - cleavage etc follows automatically.

### $\beta$ - cleavage

See  $\alpha$  - cleavage.

### Charge exchange reaction

See synonymous term *charge transfer reaction*.

### Charge inversion reaction

An ion/neutral species reaction wherein the charge on the reactant ion is reversed in sign.

### Charge permutation reaction

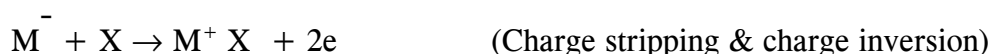
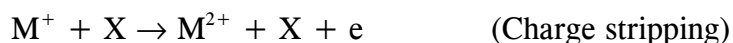
This is a general term to describe an ion/neutral species reaction wherever there is a change in the magnitude and/or sign of the charges on the reactant.

### Charge stripping reaction

An ion/neutral species reaction in which the charge on the reactant is made more positive.

### Charge transfer reaction

An ion/neutral species reaction in which the total charge on the reactant ion is transferred initially to the reactant neutral species so that the reactant ion becomes a neutral entity. Some of the possible reactions of ions  $M^{2+}$ ,  $M^+$  and  $M^-$  with a neutral species X are categorized in terms of the above definitions as follows:



These are all ion/neutral species reactions and also *charge permutation reactions*.

### **Ion/molecule reaction**

An ion/neutral species reaction in which the neutral species is a molecule. (Note the use of 'ion-molecule reaction' is not recommended; the hyphen suggests a reaction of a species that is both an ion and a molecule and is not the intended meaning).

### **Ion/neutral species reaction**

A process wherein a charged species interacts with a neutral reactant to produce either chemically different species or changes in the internal energy of one or both of the reactants.

### **Ion/neutral species exchange reaction**

In this reaction an association reaction is accompanied by the subsequent or simultaneous liberation of a different neutral species as a product.

### **McLafferty rearrangement**

This is an example of a rearrangement reaction and is defined as  $\beta$  - *cleavage* with concomitant specific transfer of a  $\gamma$  - hydrogen atom in a six-membered transition state in mono-unsaturated systems, irrespective of whether the rearrangement is formulated by a radical or by an ionic mechanism and irrespective of with which fragment the charge stays.

### **Partial charge exchange reaction**

See the synonymous term *partial charge transfer reaction*.

### **Partial charge transfer reaction**

An ion/neutral species reaction wherein the charge on a multiply charged reactant ion is reduced.