

Charge-transfer complex with possible events in SMD electrolysis and “sudo” LENR events with explanations of known chemical reactions, albeit extremely complex.

M.J.Nunnerley B.Sc.

This paper is made up of **extracts** from known facts with additions by myself from personal experimentation and records, to help explain what is possibly occurring.

A **charge-transfer complex (CT complex)** or **electron-donor-acceptor complex** is an association of two or more molecules, or of **different parts of one large molecule**, in which a fraction of **electronic charge** is transferred between the molecular entities. The resulting electrostatic attraction provides a stabilizing force for the molecular complex. The source molecule from which the charge is transferred is called the electron donor and the receiving species is called the electron acceptor.

The nature of the attraction in a **charge-transfer complex is not a stable chemical bond**, and is thus much weaker than covalent forces. Many such complexes can undergo an electronic transition into an excited electronic state. The excitation energy of this transition occurs very frequently in the visible region of the electro-magnetic spectrum, which produces the usually intense colour characteristic for these complexes, see Fig:1 below. These optical absorption bands are often referred to as *charge-transfer bands* (CT bands). Optical spectroscopy is a powerful technique to characterize **charge-transfer bands**.



Fig:1

Charge-transfer complexes exist in many types of molecules, inorganic as well as organic, and in solids, liquids, and solutions. A well-known **example** is the complex formed by iodine when combined with starch, which exhibits an intense blue **charge-transfer band**.

In inorganic chemistry, most charge-transfer complexes involve electron transfer between metal atoms and ligands.

A **ligand** is an ion or molecule (functional group) that binds to a central metal atom to form a coordination complex. The bonding between metal and ligand generally involves formal donation of one or more of the ligand's electron pairs. The nature of metal-ligand bonding can range from covalent to ionic. Furthermore, the metal-ligand bond order can range from one to three. Ligands are viewed as Lewis bases, although rare cases are known to involve Lewis acidic "ligand".

Metals and metalloids are bound to ligands in virtually all circumstances, although gaseous "naked" metal ions can be generated in high vacuum. Ligands in a complex dictate the reactivity of the central atom, including ligand substitution rates, the reactivity of the ligands themselves, and redox. Ligand selection is a critical consideration in many practical areas.

Ligands are classified in many ways: their charge, their size (bulk), the identity of the coordinating atom(s), and the number of electrons donated to the metal. The size of a ligand is indicated by its cone angle. A type of ligand exchange reaction is Nucleophilic abstraction

Nucleophilic abstraction is a type of an [organometallic](#) reaction which can be defined as a [nucleophilic attack](#) on a ligand which causes part or all of the original ligand to be removed from the metal along with the nucleophile.

Hydrogen abstraction

Nucleophilic abstraction can occur on a ligand of a metal if the conditions are right. For instance the example Fig:1 above of stainless steel with a high chromium content shows the nucleophilic abstraction of H⁺ from an [arene ligand](#) attached to chromium. The electron withdrawing nature of the chromium allows for the reaction to occur as a [facile](#) reaction.

The **Polar effect** or **electronic effect** in chemistry is the effect exerted by a [substituent](#) on modifying electrostatic forces operating on a nearby [reaction](#) center. The main contributors to the polar effect are the inductive effect, [mesomeric effect](#) and the through-space electronic, field effect which has led to the extraction of usable power by electron extraction in SMD electrolysis with a suitable receiver.

An **electron withdrawing group** or **EWG** draws electrons away from a reaction center. When this center is an **electron rich** [carbanion](#) or an [alkoxide](#) anion, the presence of the electron-withdrawing "substituent" has a stabilizing effect.

Examples of electron withdrawing groups are

- [halogens](#) (F, Cl);
- [nitriles](#) CN;
- [carbonyls](#) CO; eg. H₂CO₃ would be a good candidate
- [nitro groups](#) NO₂.

An **electron releasing group** or **ERG** (otherwise called electron donating groups or EDG) releases electrons into a reaction center and as such stabilizes electron deficient carbocations.

Examples of electron releasing groups are

- [alkyl](#) groups; eg. NaOH
- [alcohol](#) groups;
- [amino](#) groups.

The total substituent effect is the combination of the polar effect and the combined steric effects.

In [electrophilic aromatic substitution](#) and [nucleophilic aromatic substitution](#) substituents are divided

into [activating groups](#) and [deactivating groups](#) where the direction of activation or deactivation is also taken into account.

This now brings us to charge- transfer transition energy:-

Charge-transfer transition energy

The absorption wavelength of charge-transfer bands, i.e., the charge-transfer transition energy, is characteristic of the specific type of donor and acceptor entities.

The electron donating power of a donor molecule is measured by its [ionization potential](#) which is the energy required to remove an electron from the highest occupied molecular orbital. The electron accepting power of the electron acceptor is determined by its [electron affinity](#) which is the energy released when filling the lowest unoccupied molecular orbital.

The overall energy balance (ΔE) is the **energy gained in a spontaneous charge transfer**. It is determined by the difference between the acceptor's electron affinity (EA) and the donor's ionization potential (EI), adjusted by the resulting electrostatic attraction (J) between donor and acceptor.

The positioning of the characteristic CT bands in the electromagnetic spectrum is directly related to this energy difference and the balance of **resonance contributions** of non-bonded and dative states in the resonance equilibrium.

This charge transfer complex has been noted, albeit not known what is happening, by some home experimenters in the search for cheap energy, as the name suggests, it is complex. In my own experimental study with SMD, carbon in the form of graphene can be extracted from CO₂ and also under certain conditions, duty cycle, reacting time and power applied, this carbon can transmute into iron in the form of iron oxide FeO₃, a “possible” LENR reaction!. This has been cited by many over many years:-

http://www.levity.com/alchemy/nelson2_3.html

Summing up, we are still learning and have a way's to go, it is a complex field, even though the reactions can be made very easily once an activation system is known. SMD is one of those activation systems which came by accident from my hydrocarbon synthesis work along with atmospheric pressure electron beam reactors, SMD e-beam.