The electrochemiluminescence (or electrochemically generated chemiluminescence), ECL, can be defined as the light generation by means of the homogeneous electron transfer between precursors in solution. Such precursors are obtained as a consequence of heterogeneous electron transfer (electrode) reactions, leading to the formation of very active, oxidizing $D^+$ and reducing $A^-$ agents. Electron transfer, ET, between $D^+$ and $A^-$ species may lead to light emission arising at the expense of the energy released during their annihilation.

The observed emission may be understood in the context of an electron transfer model (competition between several radiative and radiationless ET processes) proposed by Marcus. The above formalism, however, is somewhat over-simplified from the mechanistic point of view. In real cases, the electron transfer excitation is preceded and followed by diffusion of reactants/products from/into bulk solutions. Moreover, ECL reactants and products are species with distinctly different spin multiplicities, which may lead to additional kinetic complications because of the spin conservation rule.

Current understanding of the ET processes allows for some predictions of light emission from a given ECL system, but (as it will be shown) quantitative description, i.e. interpretation and prediction of the spectral characteristics and the emitted light efficiency, remains a rather difficult task, because of many factors affecting or interfering with ET excitation. Some direction for further exploration and explanation of the relationships between an ECL behavior and the chemical nature (electrochemical and photophysical data) of the reacting $A/A^-$ and $D/D^+$ species (with special attention to design new ECL systems with extremely high efficiencies) will be also suggested.