A glimpse into the world of ICD and ETMD

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How does a microscopic system like an atom or a small molecule get rid of the excess electronic (or vibrational) energy it has acquired, for instance, by absorbing a photon or by impact with an ion or electron? If this microscopic system is isolated, the issue has been much investigated and the answer to this question is more or less well known. But what happens if our system has neighbors as is usually the case in nature or in the laboratory? In a human society, if our stress is large, we would like to pass it over to our neighbors. Indeed, this is in brief what happens also to the sufficiently excited microscopic system. A mechanism of energy transfer named ICD (Interatomic/Intermolecular Coulombic Decay) has been theoretically predicted and verified in by now many exciting experiments. This mechanism seems to prevail "everywhere" from the extreme quantum system of the He dimer to water, to systems in cavity, and even to quantum dots. The transfer is ultrafast and typically dominates other relaxation pathways.

ICD is often accompanied by ETMD (Electron Transfer Mediated Decay). As charge transfer is usually much slower than energy transfer, ICD dominates. However, ETMD can be widely operative when our microscopic system itself does not possess excess energy, i.e., when ICD is inactive. The energy needed is created by the ETMD itself. ICD and ETMD are introduced and discussed. Examples and arguments are presented which make clear that the processes in question play a substantial role in nature and laboratory.

Experimental and theoretical work on ICD, ETMD and related processes can be found in the Bibliography: `http://www.pci.uni-heidelberg.de/tc/usr/icd/ICD.refbase.html`

A recent review: Jahnke T *et al.* 2020, Interatomic and Intermolecular Coulombic Decay, *Chem. Rev.* **120** 11295