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Is an efficient intermolecular energy transfer from vibrations to electronic motion possible ?

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In this work we investigate the possibility of intermolecular vibrational energy transfer to electronic motion. Energy transfer of all kinds is of central importance for chemical reactivity and has been widely studied both experimentally and theoretically over many years including the transfer between the two kinds of energies, vibrational and electronic. The studies of the latter are, however, carried out in the framework of collisions where the collision complex formed and/or nonadiabatic coupling give rise to the transfer. Here, we concentrate on intermolecular vibrational energy transfer to electronic motion in weakly bound molecules, i.e., at internuclear distances at which they do not have a chemical bond and nonadiabatic coupling is negligible. We shall see that the transfer can be highly efficient [PRL 121, 223001 (2018)]. If time is left, intermolecular vibrational energy transfer between weakly bound molecules is also addressed. Here, most of the studies were done for describing *resonant* vibrational energy transfer in the condensed phase. Very recently, it has been noticed that if the lifetime of the vibrationally excited molecule is much longer than that of its neighbor, efficient *non-resonant* vibrational energy transfer can take place [doi.org/10.1080/00268976.2018.1473654].