Light absorption in molecules initiates a plethora of reactions on the ultrafast timescale. Designing the ways to control such processes, and direct light energy along a preselected pathway, is a fascinating problem. One process of particular interest is photoinduced electron transfer, which is the primary step in photosynthesis and many applications related to light-harvesting and photocatalysis. Our approach to controlling photoinduced electron transfer is to change vibronic interactions in the excited state using IR-excitation. We show that the yield of an electron transfer reaction in the excited state can be radically altered – from 100% to none - by mode-specific infrared excitation of vibrations which are coupled to the electron transfer pathway. Some proposed design criteria necessary to achieve such an effect will be discussed, and illustrated on the example of photoactive Pt(II)-based systems - donor-acceptor pairs that are similar in design to molecular systems utilized in chemical and biological light harvesting.