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Plasmon-coupled Resonance Energy Transfer: Beyond Dipole Approximation[1] KOBRA NASIRI AVANAKI, WENDU DING, GEORGE C. SCHATZ, Northwestern university, THEORETICAL CHEMISTRY TEAM — In this work, we present a comprehensive theoretical and computational study on plasmon-coupled resonance energy transfer (PC-RET) in inhomogeneous absorbing and dispersive media beyond dipole approximation. The method extends the Frster theory for the RET continuations between large particles (size comparable to the distance between them), in which the higher multipole transitions specifically magnetic dipole and electric quadrapole transitions play significant roles. In our new formulation, we show that the transition matrix elements for RET can be expressed in terms of the donor and acceptor transition dipole/quadrapole moments and the external polarization fields generated by the donor, evaluated at the position of the acceptor. Numerical calculations based on finite difference time-dependent (FDTD) method were performed on example particles, and compared with the analytical results in vacuum. The method yields a numerically simple and computationally practical approach for PC-RET calculations in relatively large particles particularly in biology, optical switching, solar cells, where energy transfer processes typically take place in inhomogeneous absorbing and dispersive media.

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