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(G*) Dynamics of exciton polaron in microtubule

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In this paper, we study the dynamical properties of the exciton-polaron in the microtubule. The study was carried out using a unitary transformation and an approximate diagonalization technique. Analytically, the modeling of exciton-polaron dynamics in microtubules is presented. From this model, the ground state energy, mobility, and entropy of the exciton-polaron are derived as a function of microtubule's parameters. Numerical results show that, depending on the three vibrational modes (protofilament, helix, antihelix) in MTs, exciton-polaron energy is anisotropic and is more present on the protofilament than the helix and absent on the antihelix. Taking into account the variation of the protofilament vibrations by fixing the helix vibrations, exciton-polaron moves between the 1st and 2nd protofilaments. It is seen that the variation of the two vibrations induces mobility of the quasiparticle between the 1st and 15th protofilament. This result points out the importance of helix vibrations on the dynamics of quasiparticles. It is observed that the mobility of the exciton polaron and the entropy of the system are strongly influenced by the vibrations through the protofilament and helix. The effects of the one through the antihelix is negligible. The entropy of the system is similar to that of mobility. Confirming that the quasiparticles move in the protofilament faster than in the helix.

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