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Bipolaron Assisted Bloch-Like Oscillations in Organic Lattices

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Abstract

The transport of a dissociated bipolaron in organic one-dimensional lattices is theoretically investigated in the scope of a tight-binding model that includes electron-lattice interactions and an external electric field. Remarkably, the results point to a physical picture in which the dissociated bipolaron propagates as a combined state of two free-like electrons that coherently perform spatial Bloch oscillations (BO) above a critical field strength. It was also obtained that the BO's trajectory presents a net forward motion in the direction of the applied electric field. The impact of dynamical disorder in the formation of electronic BOs is determined.

Keywords: Polaron, Bipolaron, Charge Transport, Conjugated Polymers.

1. Introduction

Organic semiconductors are now regarded as the most prominent solutions for developing increasingly efficient green energy applications [1, 2]. Particu-

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