Generalized Hyperbolic Functions: Exponential-Type Quantum Interactions

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Abstract : In the search of potential models applied in the theoretical treatment of diatomic molecules, some of them have been constructed by using standard hyperbolic functions as well as from the so-called q-deformed hyperbolic functions (sc q-dhf) for displacing and modifying the shape of the potential under study. In order to transcend the scope of hyperbolic functions, in this work, a kind of generalized q-deformed hyperbolic functions (g q-dhf) is presented. By a suitable transformation, through the q deformation parameter, it is shown that these g q-dhf can be expressed in terms of their corresponding standard ones besides they can be reduced to the sc q-dhf. As a useful application of the proposed approach, and considering a class of exactly solvable multi-parameter exponential-type potentials, some new q-deformed quantum interactions models that can be used as interesting alternative in quantum physics and quantum states are presented. Furthermore, due that quantum potential models are conditioned on the q-dependence of the parameters that characterize to the exponential-type potentials, it is shown that many specific cases of q-deformed potentials are obtained as particular cases from the proposal.

 ${\bf Keywords:} \ diatomic \ molecules, \ exponential-type \ potentials, \ hyperbolic \ functions, \ q-deformed \ potentials$

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1