Time-dependent Elastic Deformation in Crystal: Insights from Metric Description and Berry Phase Effect LIANG DONG, QIAN NIU, University of Texas at Austin — It is well known that elastic deformation in crystal can be described in the language of a metric. However, how the metric couples to the one-electron Hamiltonian in a deformed crystal is not very clear. By coordinate transformation from a Cartesian frame to lattice frame where all coordinates of ions are fixed, the metric emerges naturally both in the kinetic energy and potential energy of an electron. Besides, the velocity field of ions is also manifested in the Hamiltonian, which resembles the role of a vector potential. When the deformation slowly varies both in space and time, the wave-packet method can be used to study the Berry phase effect of deformation. This method applies to finite-strain cases and is accurate up to the first order of strain gradient. Different deformation effects are discussed, such as piezoelectricity, flexoelectricity and curving effect of a two-dimensional material

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