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GENERAL PHYSICS

B.-F. APOSTOL,

Elasticity of an axially anisotropic solid body 273

The elastic energy of an axially anisotropic solid body is derived by starting from the general principles of linear elasticity. The elastic waves propagating in such a body are obtained by solving the equations of motions with the aid of two suitable canonical transformations. The relevancy of the corresponding elastic constants is discussed in connection with the axial symmetry, and a comparison is made with other similar calculations.

GENERAL PHYSICS- QUANTUM MECHANICS

RADU PAUL LUNGU,

Floquet solutions for quasi-free electrons in two-dimensional crystalline lattice 279

The quasi-energies and the reduced Floquet eigen-vectors corresponding to an electron in 2-dimensions, interacting with a time-dependent monochromatic, linearly polarized electromagnetic field, and in the presence of a weak, spatial periodic field (varying in both directions) are calculated. These computations are performed using a variant of the stationary perturbation theory in the extended Hilbert space, adapted for the eigenvalue equation of the Floquet Hamiltonian. The perturbative corrections, in the first orders, show that the quasi-energy spectrum has gaps at the boundaries of the Brillouin zones, and the Floquet eigen-functions have Bloch forms. These results have similarities to those of the quasi-free electron model.

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We investigate the reliability of the local error estimates returned by Gauss-Kronrod quadrature rules under the use of several error estimators: Gauss-Kronrod, QUADPACK, as well as their self-validation with natural conditions inferred from the study of the outputs of typical elementary integrals. The error estimator which gathers all the validation conditions is found to yield the sharpest and the most reliable error estimates. The self-validating scheme of the local error estimates is easy to implement and adds little supplementary computing effort. It strengthens considerably the correctness of the decisions within the automatic quadrature.

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CONDENSED MATTER

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Metallic clusters 345

Large metallic clusters of heavy atoms are described within the quasi-classical theory, by means of a variational approach to the linearized Thomas-Fermi model. Effective inter-atomic potentials are derived and equilibrium spatial structures are given; these structures are universal for homo-atomic metallic clusters, in the sense that they are independent of the chemical nature of the atoms. The binding energies, interatomic distances, and the vibration spectra are computed as functions of the effective number of "valence" electrons; this effective valence is estimated from the atomic screening. Magic numbers are obtained, corresponding to close spatial packings; these geometric magic numbers are also universal for homo-atomic metallic clusters, in the sense that they do not depend on the atomic species. The quadrupole-deformed potential for the electrons in a metallic cluster is also derived. The extension of the theory to including ionic or covalent bonds is discussed.

NUCLEAR PHYSICS

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Phenomenological three center model 365

Experimental results on ternary fission of ^{252}Cf suggest the existence of a short-lived quasi-molecular state. We present a three-center phenomenological model able to explain such a state by producing a new minimum in the deformation energy at a separation distance very close to the touching point. The shape parametrization chosen by us allows to describe the essential geometry of the system in terms of one independent coordinate: the distance between the heavy fragment centers. The shell correction (also treated phenomenologically) only produces quantitative effects; qualitatively it is not essential for the new minimum. Half-lives of some quasi-molecular states which could be formed in ^{10}Be accompanied fission of ^{236}U , ^{236}Pu , ^{246}Cm , ^{252}Cf , $^{252,256}\text{Fm}$, $^{256,260}\text{No}$, and ^{262}Rf are roughly estimated.

M. MIREA, V. CARTAȘ,

Qualitative and quantitative description of fission 383

A model is used to determine the fission products of ^{238}U . The deformation energy of the decaying system is obtained within the microscopic-macroscopic model using a two-center nuclear shape parametrization. This model takes into account the excitation energy of the target nucleus and the evaporation of prompt neutrons. The isotopic yields of the induced fission are obtained for all mass partitions.