INVESTIGATION OF THE BOSONIC SPECTRUM OF TWO-DIMENSIONAL OPTICAL GRAPHENE-TYPE LATTICES. NORMAL PHASE

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S u m m a r y

The band spectrum of bosonic atoms in two-dimensional honeycomb optical lattices with the graphene-type structure has been studied. The dispersion laws in the bands and the one-particle spectral densities are calculated for the normal phase in the random phase approximation. The temperature-dependent gapless spectrum with Dirac points located at the Brillouin zone boundary is obtained for the lattice with energetically equivalent sites, with the corresponding chemical potential lying outside the allowed energy band. Different on-site energies in the sublattices are shown to induce the appearance of a gap in the spectrum, so that the chemical potential can be located between the subbands, which gives rise to a substantial reconstruction of the band spectrum. The frequency dependences of the one-particle spectral density for both sublattices are determined as functions of the chemical potential level, the spectral gap magnitude, and the temperature.