Surface Plasma Wave in Semiconductor Quantum Plasma withSpin-up and Spin-down Exchange Interaction

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In this paper, wepropose a scheme of stimulated SPW excitation in magnetized quantum plasma viastimulated electron-hole recombination in the proximity of the guiding surfaceusing the modified SSE-QHD model taking into account the spin polarizationproduced due to difference in concentration of spin-up and spin-down electrons.The quantum effects of Bohm potential and Fermi electron pressure have alsobeen included in the analysis. We assume a three layer system: a thin layer ofn-type semiconductor sandwiched between a metal and a p-type semiconductor. Thep-n junction is forward biased and is within a few microns from the metal surfacewhere SPW is guided. The mechanism of optical gain of the SPW is as follows.The mode structure of the SPW field encompasses the p-n junction. The SPW fieldstimulates electron-hole recombination producing surface plasmons. The enhancedSPW field induces stronger e-h recombination, thus exponentiating the growthrate of SPW in the initial stage of instability. The dispersion relation andPoynting flux of the SPW in magnetized quantum plasma has been obtained. Theoptical gain has been calculated and analysed graphically.

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