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Optical lattices for electrons in semiconductors CARLO PIERMAROCCHI, MICHAEL G. MOORE, MARTIN J. A. SCHUETZ, Michigan State University, MONIQUE COMBESCOT, Instutute of Nanosciences, Pierre et Marie Curie University, Paris France — We theoretically investigate the trapping of electrons in a semiconductor using counter-propagating laser beams. We consider two different physical mechanisms that can lead to an efficient electron trapping: (a) Pauli blocking between the electron and a virtual exciton coupled to the laser field, and (b) the virtual excitation of a three-body Coulomb resonance corresponding to a bound charged exciton state (a trion). Both processes induce a momentum transfer between photon and electron, and lead to a sinusoidal trap for electrons with a period determined by the laser beam modulation. The depth of the potential is proportional to the laser intensity and inversely proportional to the exciton-photon detuning. Competing effects such as laser heating, phonons, and disorder are analyzed.

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