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Hole-LO phonon interaction in InAs/GaAs quantum dots
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LEMAÎTRE, Laboratoire de Photonique et de Nanostructures — Various experi-
mental and theoretical works demonstrate that electrons confined in quantum dots
are strongly coupled to the longitudinal optical(LO) vibrations of the underlying
semiconductor lattice [?]. This leads to the formation of the so-called quantum dot
polaron, which are the true excitations of a charged dot. The interaction between
holes confined in quantum dots and LO phonons has not, until now, been explored.
We present a study of holes confined in InAs/GaAs quantum dots doped with Be.
The interaction between the holes in the dots and the LO phonons of the lattice
is studied experimentally by spectroscopy in the FIR ($50 - 700 \text{ cm}^{-1}$) energy range
and under the influence of a magnetic field (0-15T). We observe several resonances
in magneto-transmission around 200 cm^{-1} . In order to interpret our experimental
results, we calculate the coupling between the hole-phonon states, using the Fröhlich
Hamiltonian. The resulting polaron states we find are in good agreement with our
experimental results.

References

- [1] S. Hameau *et al.*, Phys. Rev. Lett. **83**, 4152 (1999); S. Hameau *et al.*, Phys.
Rev. B**65**, 85316 (2002).

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