EFFECT OF PRESSURE ON SOFT EXCITATIONS IN GLASSES: THEORY AND EXPERIMENT

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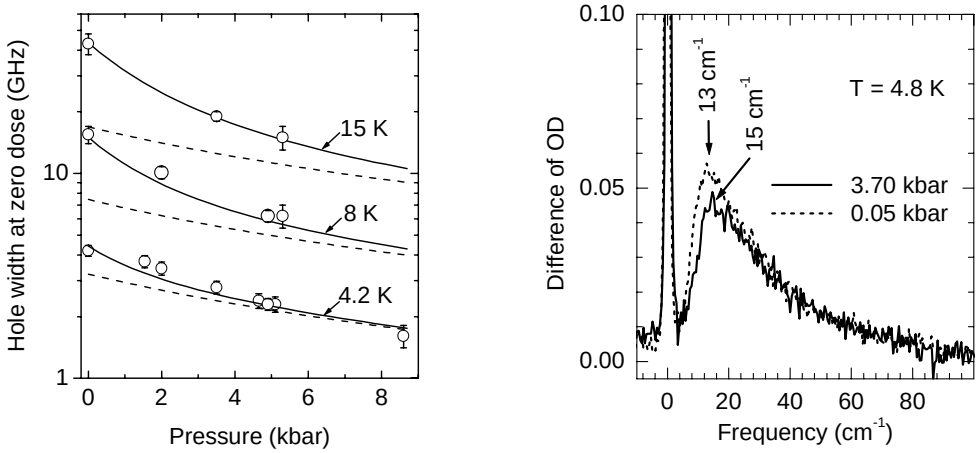
A theory is proposed, which predicts the reduction of the number of soft localized excitations in glasses under pressure. This occurs because the majority of these excitations have a negative cubic anharmonicity. For that reason the applied pressure predominantly transforms soft localized vibrational modes and soft (low-energy) tunneling two-level systems into higher-energy two-level systems, whereas the simultaneous reverse transformations of available non-soft two-level systems into soft localized modes and into soft two-level systems are less numerous. The experimentally observed pressure-induced narrowing of spectral holes [1,2] and the suppression of the low-frequency part of the phonon sideband in the absorption spectrum is in agreement with our the theory.



In the figures given above we present spectral hole widths (left: lines – theory, points - experiment) and phonon sideband profiles (right) at different pressures for chlorine-doped glassy polystyrene in isobaric-isothermal experiments.

[1] A. Ellervee, R. Jaaniso, J. Kikas, A. Laisaar, A. Suisalu, and V. Shcherbakov, Chem. Phys. Lett. **176** (1991) 472.
[2] V. Hizhnyakov, A. Laisaar, J. Kikas, An. Kuznetsov, V. Palm, and A. Suisalu, Phys. Rev. B **62** (2000) 11296.