# Review of: "Correlating exciton coherence length, localization, and its optical lineshape"

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Potential competing interests: No potential competing interests to declare.

Spectral lineshapes are very sensitive to the environment. One of the effects – phonons – is a very hot topic of research in excitonic community. In this work, the authors perform a semi-phenomenological analysis on how the properties of 1D excitons, including the reorganization energy, wavefunction and the homogeneous line width depend on the model parameters - exciton hopping parameter and phonon coupling. Equations (15),(16) and analytical results (17),(18), (21), (25), (27) obtained in terms of simple but physically transparent parameters are also rather transparent and reflect the physics behind the model.

In my opinion, the main result of the paper is Fig.1 – the linewidth of self-trapped exciton as function of temperature at different reorganization energies. As it follows from the figure, the width is temperature-independent up to temperature of the order reorganization energy and is proportional to temperature just above this temperature point. In this sense, it would be also interesting to explore the dependence on the phonon coupling chi.

Other desirable addition – comparison of the results of Fig. 1 with experimental data, i.e. how much the model can catch. For example, I can imagine that in some systems acoustic modes (coupling proportional to the phonon momentum) and in some optical (finite coupling at zero momentum) can be dominant. Then, how accurate would be approximation of momentum-independent chi in these cases (though, I realize that the authors are mostly deal with localized states)?.

Some other, minor but important, technical changes to the paper would be beneficial:

1. Details or references of derivation of Eqs. (1), (10), (19), (20).
2. What are “two expressions” mentioned before Eq. (20)?
3. Discuss how the results would change in higher dimensions?
4. Discuss how the results would change in the case of indirect excitons (systems with indirect gap, where one could have direct and indirect excitons, what about the linewidths for them).

In general, in my opinion this is an interesting paper, it contains explicit results interesting to the community derived from physically understandable and transparent model.