Polarization-resolved photoluminescence for imaging excitons and trions drift in Van der Waals heterostructures

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Abstract
We perform polarization resolved photoluminescence (PL) studies at cryogenic temperature [1] on TMDs from monolayers encapsulated by hexagonal boron nitride (hBN) by using tunable lasers (from visible to infrared range). I will present results obtained imaging the PL's spatial distribution under a tightly focused laser excitation. An example is reported in the Figure where we have observed a halo shape of PL on the trion when increasing the excitation power of CW laser at low temperature (20K). [2] Spatially and spectrally resolved luminescence spectra reveal the buildup of a significant temperature gradient at high excitation power, we attribute to the energy relaxation of photo induced hot carriers. A numerical resolution of the transport equations for excitons and trions indicates that the halo can be interpreted as thermal drift of trions due to a Seebeck term in the particle current. The technique can be naturally extended to devices with tunable doping.

References

[1] Favorskiy, I., et al., Review of Scientific Instruments, 81.10 (2010) 103902.
[2] S. Park et al, Imaging Seebeck drift of excitons and trions in MoSe2 monolayers (submitted)

Figures

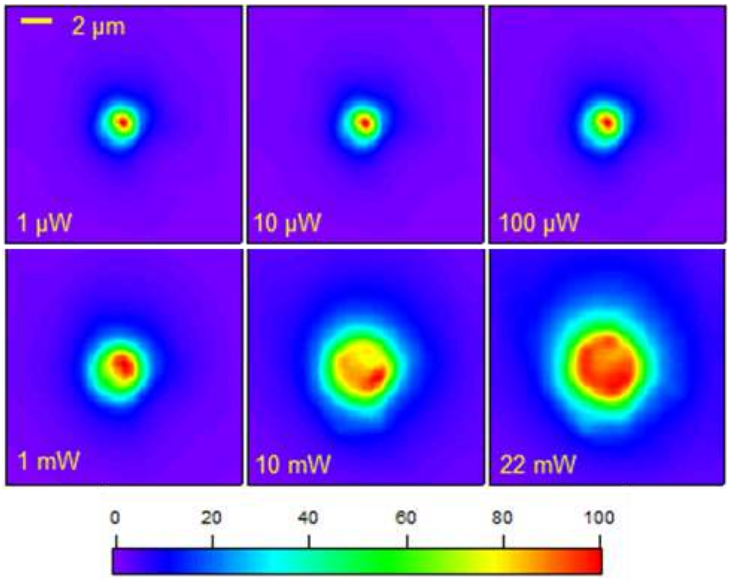

Figure 1: Spatial dependence of the trion's luminescence image for selected excitation powers.