Studies of low temperature photoluminescence spectra and excitonic valley polarization in monolayer MoTe2

SANDHAYA KOIRALA, SHINICHIRO MOURI, YUHEI MIYAUCHI, KAZUNARI MATSUDA, Kyoto Univ - Uji Campus, KYOTO UNIVERSITY TEAM — Recently, atomically thin layered transition-metal dichalcogenide (TMDs) in the form MX₂ (M = Mo, W, X = S, Se, Te) have attracted much interest from the viewpoints of their fundamental physics and potential applications [1, 2]. The characteristic optical features of semiconducting TMDs arise from excitons confined in their atomically thin layers. Molybdenum ditelluride MoTe₂ has attracted emerging research interest because of optical gap energy (lowest exciton transition) of 1.09 eV, and large spin-orbit coupling of 250 meV. Temperature-dependent photoluminescence (PL) and polarization-resolved PL measurement were performed for mechanically exfoliated monolayer MoTe₂ from 4.4 to 300 K. At a low temperature, the PL spectra from MoTe₂ show two sharp peaks for excitons and charged excitons (trions). The systematic temperature-dependent PL measurements reveal that the homogeneous linewidth of the exciton peak broadens linearly as the temperature increased due to exciton–acoustic-phonon interactions [3]. From polarization-resolved PL measurements, the valley polarization of above 40 % in the exciton state has been observed at low temperatures. In this meeting, we will discuss about exciton dephasing and valley polarization in monolayer MoTe₂.


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