7th International Workshop on 2D Materials

Title of the Presentation: Title of your presentation

First Name: Hye Ryung

Last Name: Byun

Affiliation: Department of Physics, Sogang University, Seoul, Korea

Email: hrbyun@sogang.ac.kr

Short Biography:

Hye Ryung Byun received her B.S. (2013) and M.S. (2015) in Physics from Kangwon National University. After that, she received her Ph.D. in Energy Science at Sungkyunkwan University in 2019. She is currently a postdoctoral research fellow in Prof. Jang's group at Sogang University. Her research focuses on novel optical properties of two-dimensional hybrid perovskites and nonlinear optical materials. In 2019, she was awarded the "Yongmun Semiconductor Thesis Award" by the Korean Physical Society (KPS) at the KPS fall Meeting. In 2020, she was awarded the "2020 KPS-KOFWST young research fellowship" by the KPS.

Abstract:

Two-dimensional (2D) layered organic-inorganic lead halide perovskites have emerged as new generation of optoelectronic materials due to their naturally formed multiple quantum-well structure, unique photoelectric properties and better environmental stability compared to three-dimensional perovskites [1]. Recently, intentional doping with magnetic impurities in the perovskite family has been performed for introducing new functionalities in semiconductors. For example, defect-tolerant $CsPbX_3$ (X=Cl, Br, I) nanocrystals were doped with Mn to improve optical properties and thermodynamic stability of the host material [2]. While the properties of free excitons or devices with Mn-doped 2D perovskites have been investigated, studies on excitonic matter and their interaction with Mn impurities remain elusive. In this work, we synthesized large-area, Mn-doped BA_2PbBr_4 ($BA=C_4H_9NH_3$) single crystals by a one-pot solution method. We investigated the exciton-biexciton population and relaxation dynamics in terms of the mass action law as a function of Mn doping ratio in order to understand the impact of Mn on the optical properties of the 2D perovskites. We report on some key physical parameters such as biexciton binding energy and exciton-exciton capture coefficient to form a biexciton by analyzing both temperature- and power-dependent photoluminescence spectroscopy.

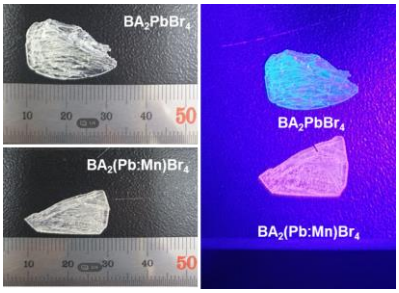

Fig. 1. Photograph of BA_2PbBr_4 and Mn-doped BA_2PbBr_4 single crystals under white light (left) and 405-nm laser light (right).

[1]W. Li et al., Nanophotonic, 9, 2001-2006(2020).
[2]D. Parobek et al., Nano Lett. 16, 7376-7380 (2016).