Absorption enhancement of two-dimensional photodetectors based on WSe_2 by ordered plasmon nanotriangles Ag

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Here we report a multiple increase in the absorption of the two-dimensional semiconductor WSe_2 due to the use of ordered triangular plasmonic silver particles. The simulated structure stack consisted of a silicon substrate with a SiO_2 layer (90 nm thick), WSe_2 film (one monolayer) located on it, and silver plasmonic structures. Silver was used as the material for the plasmonic elements since it has the highest efficiency of standing plasmon waves excitation [1]. In the course of modeling, the optimal parameters (such as the period and size) of plasmonic structures were determined for different wavelengths of the visible range. Since the free charge carrier generation in a semiconductor, and hence photosensitivity, is linearly related to the number of absorbed photons, these dependencies should have the same form [2]. A comparison is made between the theoretically calculated absorption and the experimentally obtained photocurrent. The results obtained can be used to develop polarization-sensitive photodetectors based on two-dimensional films with plasmon gratings.

[1] Li S, Miao P, Zhang Y, Wu J, Zhang B, Du Y, Han X, Sun J and Xu P 2020 *Advanced Materials* **33**

[2] Buscema M, Island J O, Groenendijk D J, Blanter S I, Steele G A, van der Zant H S J, and Castellanos-Gomez A 2015 *Chemical Society Reviews* **44**