9th International Conference on Materials Science and Nanotechnology for Next Generation

Gazi University, Ankara, Turkey, Sep 22-24, 2022

Electronic Transport Properties of WS_2 With Ensemble Monte Carlo Method

M. Derya Alyörük [1,2,*], H. Cengiz Çekil[3], Berrin Özdemir[3], Zeki Yarar[4], Metin Özdemir[3]

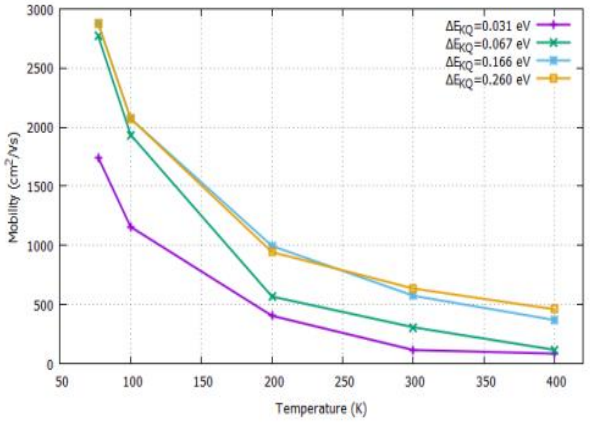
[1]*Department of Physics, Aksaray University, 68100 Aksaray, Türkiye*

[2] *Department of Medical Services and Techniques, Opticianry Program, Health Services Vocational School, Aksaray University, 68100 Aksaray, Türkiye*

[3]*Department of Physics, Çukurova University, 01330 Adana, Türkiye*

[4]*Department of Physics, Faculty of Arts and Sciences, Mersin University, Çiftlikköy, 33343, Mersin, Türkiye*

Abstract: The electronic transport characteristics of Tungsten disulfide (WS_2) sheets are studied by an Ensemble Monte Carlo (EMC) technique in the presence of phonon (acoustic, optic) scattering mechanisms where intra and intervalley scatterings are considered in a two valley model. Only intrinsic (WS_2) case is considered. The drift velocity of carriers is calculated as a function of time at a given value of applied field and from these, the steady state drift velocity-applied electric field curves are obtained for different temperatures in the presence of all scattering mechanisms just mentioned. It is found that the mobility of carriers sensitively depends on the energy difference ΔE_{KQ} between the minimums of the two valleys. The mobility of carriers is calculated as a function of temperature and the results are compatible with existing theoretical predictions.



Keywords: WS_2, Ensemble Monte Carlo, Scattering, Transport, Drift velocity, Mobility

*Corresponding author.
E-mail: mderyaozdemir@aksaray.edu.tr