Jakub Jagiello
Artur Dobrowolski, Tymoteusz Ciuk
Lukasiewicz Research Network – Institute of Microelectronics and Photonics, Aleja Lotnikow 36/46 02-668, Warsaw, Poland

jakub.jagiello@imif.lukasiewicz.gov.pl

Investigation of graphene on SiC under neutron irradiation by Raman Spectroscopy

In this work, we report study on the impact of neutron radiation on quasi-free-standing (QFS) graphene [1]. For this purpose, we have fabricated hydrogen-intercalated QFS graphene on semiinsulating high-purity 4H-SiC (0001) [2], passivated with an Al_2O_3 layer [3], and exposed it to a fast-neutron fluence of ≈ 6.6 x 10^{17} cm^{-2}. The result have shown that the graphene sheet is only moderately affected by the neutron radiation with the estimated defect density of ≈ 4 x 10^{10} cm^{-2}. The effect was more pronounced within the SiC step edges than the terraces [4]. However, in both cases the defect density was seven orders of magnitude lower than the fluence, which indicates that graphene has a small cross-section for neutrons.

References

[1] S. El-Ahmar, M. Szary, T. Ciuk, R. Prokopowicz, A. Dobrowolski, J. Jagiello, M. Ziemba, Applied Surface Science (2022), 152992
[2] T. Ciuk, B. Stanczyk, K. Przyborowska, D. Czolak, A. Dobrowolski, J. Jagiello, W. Kaszub, M. Kozubal, R. Kozlowski, P. Kaminski, IEEE Trans. Electron Devices 66 (7) (2019), 3134-3138.
[3] K. Pietak, J, Jagiello, A. Dobrowolski, R. Budzich, A. Wysmołek, T. Ciuk, Applied Physics Letters, 120 (2022) 063105
[4] A. Dobrowolski, J. Jagiello, D. Czolak, T. Ciuk, Physica E: Low-dimensional Systems and Nanostructures, 134 (2021) 114853

Figures

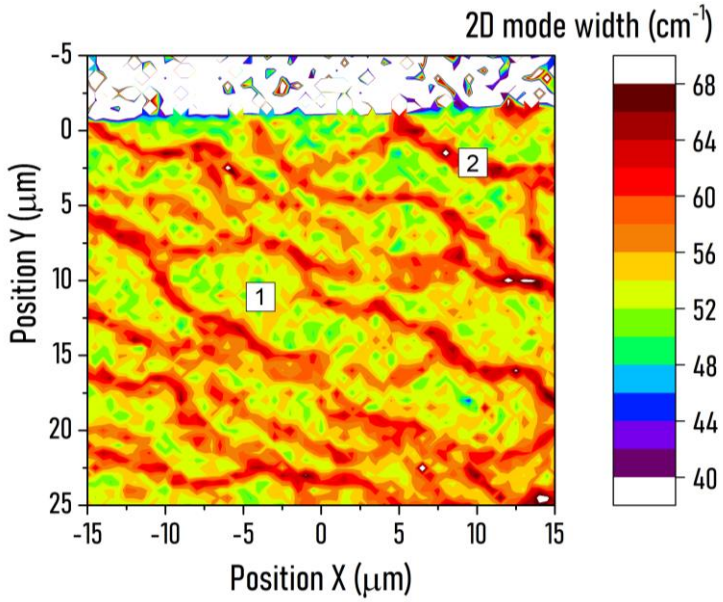

Figure 1: High-resolution post-neutron-irradiation Raman map (2D band width) of hydrogen-intercalated QFS epitaxial CVD graphene on semiinsulating high-purity on-axis 4H-SiC (0001), all passivated with a 100-nm-thick-atomic-layer-deposited aluminum oxide layer. Spots numbered 1 and 2 have their individual Raman spectra.