Graphene on SiC as a Potential Magnetic Field Detector Resilient to High Temperature and Neutron Radiation

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Power industry is in need of rapid development of zero-emission technologies, as we face climate crisis. Nuclear reactors, aside from its power generation abilities, significantly contribute to development of other technologies, like nuclear fusion. The magnetic confinement fusion devices pose a challenge of precise magnetic field diagnostic that is required to contain electrically charged plasma. The challenge is to overcome extreme conditions, defined as strong neutron radiation and high temperatures up to 350°C. A new type of materials is sought that would be able to meet such difficult requirements [1]. Therefore, we report on the first experimental study on the impact of neutron radiation on quasi free-standing (QFS) graphene, [2] which was made possible thanks to MARIA research reactor that simulated those extreme conditions. For this purpose, we have fabricated hydrogen-intercalated QFS graphene on semiinsulating high-purity 4H-SiC(0001), passivated it with an Al_2O_3 layer, [3] and exposed it to a fast-neutron fluence. Our findings suggest that the system may be a promising platform for magnetic diagnostics in magnetic-confinement fusion reactors.

References

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