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Growth of epitaxial graphene on SiC and its sensing application

To develop growth conditions for cm scale monolayer (ML) graphene on SiC, a series of samples were grown on SiC substrates in argon ambient and in an inductively heated furnace. Graphene formation was analyzed in respect to step bunching and surface decomposition energy. The result showed that the buffer layer halts the step bunching process, which means the surface energy becomes uniform all over the substrate surface after the coverage by a buffer layer. Graphene samples grown at different argon ambient pressure prove that there is an optimal argon pressure yielding a large coverage of ML graphene. The environment, temperature, and time dependence of the graphene layers also will be presented in this work. Here surface functionalization of epitaxial graphene grown on SiC was performed by two methods, i) Silver ion irradiation at four different fluence, ii) doped graphene quantum dots with Cl, B, and N, to investigate their gas sensing capabilities. As-fabricated sensors were tested at room temperature with NO_2, NH_3, and C_6H_6. The AFM study on irradiated graphene layer showed formation of hillocks, wrinkles, and folding of graphene. The gas sensing results indicated existence of an optimal fluence and consequently optimal amounts of defects, which maximize the gas sensing response towards NO_2 and NH_3 gases. The results for functionalization with doped GQDs showed that sensitivity towards NO_2 for the GQD-sensors were clearly lower than pristine epitaxial graphene. Moreover, Cl-doped sensor showed outstanding limit of detection and response time towards C_6H_6 in ppb range (down to 25 ppb).

Biography

G Reza Yazdi has completed his PhD in (2008) from Linkoping University and Postdoctoral studies from the same university. He has published more than 40 papers and book chapters in reputed journals.

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