First-principles study of siloxene and germoxene: Stable conformations, electronic properties and defects

Apostolos Atsalakis
University of Cambridge, UK

Recent interest in two-dimensional (2D) forms of Si and Ge has surged recently with a focus on silicene and germanene, the Si and Ge-based analogues of graphene as well as their derivatives. Siloxene and germoxene are 2D materials made of honeycomb Si and Ge backbone sheets that are decorated with H atoms and OH groups. This work uses first-principles calculations to probe the properties of their various conformations. It is shown that the most stable siloxene (and germoxene) polymorph is the so-called washboard structure and not the chair geometry assumed in previous studies. The stability of the washboard configuration relates to the formation of a network of hydrogen bonds between its hydroxyl groups. It is also found with hybrid functional calculations that siloxene and germoxene are wide band-gap semiconductors with gap values of 3.20 eV and 2.64 eV, respectively. Finally, we show that H and OH vacancies introduce spin polarization in these 2D materials and have a tendency to pair up in stable di-vacancies.

aa852@cam.ac.uk

Evaluation of circulatory RNA based biomarker panel in hepatocellular carcinoma

Ahmed Hassan Fawzi El-Tawdi
Ain Shams University, Egypt

The circulating transcriptome (coding and non-coding) plays a critical role in cancer and novel accurate strategies for early detection of hepatocellular carcinoma (HCC) are strongly needed. We chose a HCC-specific RNA based biomarker panel based on the integration of differential lysosomal associated membrane protein 2 (LAMP2) gene expressions with its selected epigenetic regulators using bioinformatic methods. This was followed by RT-qPCR validation in serum of 78 patients with HCC, 36 patients with chronic hepatitis C (CHC) infection and 44 healthy volunteers. We used risk score analysis to evaluate the diagnostic efficacy of the serum profiling system. Moreover, in 20 of the 78 HCC cases involved in the study; we examined the expression of RNA based biomarker panel in both HCC and adjacent non-tumor tissues and assessed their correlation with the serum level of this panel. The 4 RNA based biomarker panel [long non-coding RNA-C terminal binding protein, androgen responsive (lncRNA-CTBP), microRNA-16-2 (miR-16-2), microRNA-21-5-P (miR-21-5p) and LAMP2 had high sensitivity and specificity for discriminating HCC from healthy controls and also from CHC patients. Among these 4 RNAs serum miR-16-2 and miR-21-5p were independent prognostic factors. The circulatory RNA based biomarker panel can serve as a potential biomarker for HCC diagnosis and prognosis.

drtawdi@yahoo.com

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