Synthesis of Quenched produced Diamond by physical vapor deposition for various applications

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https://doi.org/10.5109/7157924

出版情報：Proceedings of International Exchange and Innovation Conference on Engineering & Sciences (IEICES). 9, pp.18-19, 2023-10-19. 九州大学大学院総合理工学府
バージョン：

Keynote Speaker

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Short Biography

Dr. Abdelrahman Zkria is an Appointed Associate Professor at the Center for Japan-Egypt Cooperation in Science and Technology, Kyushu University. He obtained Ph.D. degree in Applied Physics from the Graduate School of Engineering Sciences (IGSES), Kyushu University, Japan, in 2017, M.Sc. degree in nanophysics and solid-state physics from the Institute of Physics, University of Graz, Austria, and Aswan University, Egypt, in 2012, and B.Sc. degree from Aswan University, Egypt, in 2006,

He worked as a JSPS Postdoctoral Fellow with the Department of Applied Sciences for Electronics and Materials, Kyushu University, from 2017 to 2019, on the project of "Development of nanocarbon thin films for all-carbon photovoltaics". He also joined the Department of Material Science and Engineering, North Carolina State University as a visiting scientist from Nov. 2018 to Mar.2019.

Since April 2020, Dr. Abdelrahman is working with the Education Support Department at the Center for Japan-Egypt Cooperation in Science and Technology, Kyushu University-Chikushi branch. The main responsibilities include the promotion of the project between the Graduate School of Engineering Sciences (IGSES), and the Department of Chemical and Petrochemical Engineering (CPE), E-JUST, Egypt by developing the project education program, matching Egyptian doctoral students with Japanese host laboratories, Co-supervising and Teaching of E-JUST students. His specific research interests are in the synthesis of nanomaterials, thin-film deposition, and diamond-related materials. He has more than 30 journal articles and has been an invited speaker at many international conferences.

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Abstract

Nanodiamond composite coatings combine diamond crystallites embedded inside an amorphous carbon phase. Owing to sp3 hybridized carbon bonding of diamond crystallites, these films yield impressive mechanical properties, outstanding biocompatibility, and antibacterial properties. Commonly, Nanodiamond films are prepared by chemical vapor deposition (CVD). In CVD, the initial nucleation of diamond is required, specifically, a seeding procedure with diamond powders as a pretreatment of substrates prior to the film deposition, and high substrate temperature. Such preparation conditions limit the variety of non-diamond substrates used for the heterogeneous growth of diamond films by CVD.

On the other hand, Quenched-produced diamonds, formerly called Nanodiamond (ND) films have been grown by a physical vapor deposition approach, namely coaxial arc plasma deposition (CAPD), without the pretreatment of substrates and at room temperature.

In our research group at Kyushu University, we realized the growth of Quenched-produced diamond films by the CAPD method. For electronic applications, we demonstrated the n- and p-type semiconductors by Nitrogen and Boron doping, respectively [1-3]. Most recently, we succeeded in the growth of Q-diamond on Titanium substrates at room temperature by a hybrid configuration of ion etching gun (IG) and CAPD employing in-situ Argon etching. The grown Q-diamond on Ti has been proposed for the implant applications [4,5]

References:

1) A. Zkria *et al*, Nanomaterials 2022, 12, 854. doi.org/10.3390/nano12050854
2) A. Zkria *et al* 2020 Phys. Scr. 95 095803. DOI 10.1088/1402-4896/aba97e
3) A. Zkria and T. Yoshitake, 2017 Jpn. J. Appl. Phys. 56 07KD04. DOI 10.7567/JJAP.56.07KD04
4) Lama Osman et al 2022 *Appl. Phys. Express* 15, 115004
5) Lama Osman *et al*, 2023 Mater. Res. Express 10, 066401.