Topical Symposia
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TSP-1 Improved Electron Field Emission Characteristics of Amorphous Carbon Film Embedded with Graphene Nanocrystallites, *K Sun, L Yang,* Xi'an Jiaotong University, China*;* ***Dongfeng Diao,*** Shenzhen University, China

With excellent mechanical, chemical, and electronic properties, carbon-based thin films have drawn much attention as field emitter candidates in the past few years. Since amorphous carbon (a-C) films don't have outstanding characteristics on s and emission currents, metals are often doped in a-C films to improve the field emission characteristics . Graphene exhibits lower s and larger emission currents, but the emitters are easy to be destroyed under high voltages. Therefore, embedding graphene nanocrystallites in the surfaces and interior structures of a-C film s could be a potential method to improve field emission characteristics of a-C films.

In this study, a-C films and graphene sheet embedded carbon (GSEC) films ware prepared in electron cyclotron resonance (ECR) electron irradiation with different electron irradiation energy. Then the surface morphologies and structures of films were characterized by scanning electron microscope (SEM) and transmission electron microscope(TEM). The field emission currents were measured with a parallel plate capacitor setup. The results showed that GSEC films had a better field emission property than a-C films. The formation of graphene nanocrystallite lowered the work function and increased the local field enhancement factor on the surfaces, and enhanced the conductivity in the interior structures. The research highlighted that graphene nanocrystallite structures embedded in amorphous carbon films have an important role in electron field emission.

TSP-2 Zirconium Carbide Based Self-Healing Ceramics, ***Angela Yang,*** University of North Texas, USA*; P Petry,* University of Rouen, France*; I Hammood, R Reidy, S Aouadi,* University of North Texas, USA

Self-healing ceramics are novel materials that have the ability to restore mechanical properties of cracked materials through annealing. This research focuses on the self-healing ability of zirconium carbide based nano-composites. Zirconium carbide is a stable compound and is commonly used in harsh environments, such as those encountered in space and aerospace applications. A Vickers Hardness Tester was used to inflict small diamond shaped cracks in the sample. The sample was then self-healed through heating at 1100°C for four hours and analyzed using scanning electron microcopy and x-ray diffraction to determine the chemical and structural changes that occurred at the crack site. Three sample compositions were tested for their self-healing ability in this study, namely $ZrC/SiC/Y_2O_3$, $ZrC/Al_2O_3/Y_2O_3$, and $ZrC/Si_3N_4/Y_2O_3$. Sintered and unsintered samples of the same composition were compared to each other. The sintered samples were heated to 1000°C for three hours. The introduction of Fe_2O_3 to $ZrC/SiC/Y_2O_3$ interestingly was found to yield tubular whiskers when sintered.

Author Index

Bold page numbers indicate presenter