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Nanocrystalline diamond based protective optical coatings for infrared windows

Diamond has remarkable thermal and mechanical properties including extreme thermal conductivity, low thermal coefficient of expansion, hydrophobicity, chemical inertness, and ultra-hardness for scratch-resistance and durability. Coupled with high optical transmissivity over a broad wavelength range (UV-VIS-IR), these attributes make diamond an ideal protective coating for optical components and windows used in extreme environments. In this work we investigate the use of Nanocrystalline Diamond (NCD) based multi-layer structures for the protection of MWIR windows, an application that is critical for sustained sensor operation in extreme battlefield conditions. The effort

incorporates layer designs based on measured optical constants and commercially available optical design software (Open Filters). Protective films deposited via CVD techniques on optical quality silicon substrates are characterized for mechanical and optical properties including hardness, stress, transmissivity, and optical constants. Measured results demonstrate NCD viability as a protective coating for a broad range of optical applications. The technology is compatible with large area scaling, low-temperature deposition on sensitive surfaces, and, in future adaptations, will support integrated transparent electronics.

Biography

Adam Khan is Founder and CEO of AKHAN Semiconductor. Mr. Khan has authored several patents and technical publications and is also a frequent speaker on Diamond Semiconductor and Clean Technology. As a result of his award-winning research, which he began as an Electrical Engineering student at age 19, he is co-inventor of the Miraj Diamond™ Platform.



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He has served as a speaker and expert witness to a variety of Federal bodies, including the US House Space, Science, and Technology Committee and the US Department of Energy. Most recently, his work was recognized and individually honored by the United States Congress in the 114th Congressional Records and Proceedings. Adam earned his BS in Electrical Engineering and Physics from the University of Illinois Chicago, before pursuing graduate research at Stanford University. He has been everything from a Forbes 30 Under 30 honoree, to a CleanTech Open Midwest Innovation Summit winner.

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