ARRADIANCE ***Sneak Preview***

Enhancement of Field Emission Properties of Carbon Nanotube Forests by Direct Growth on Titanium Nitride-Coated Substrates

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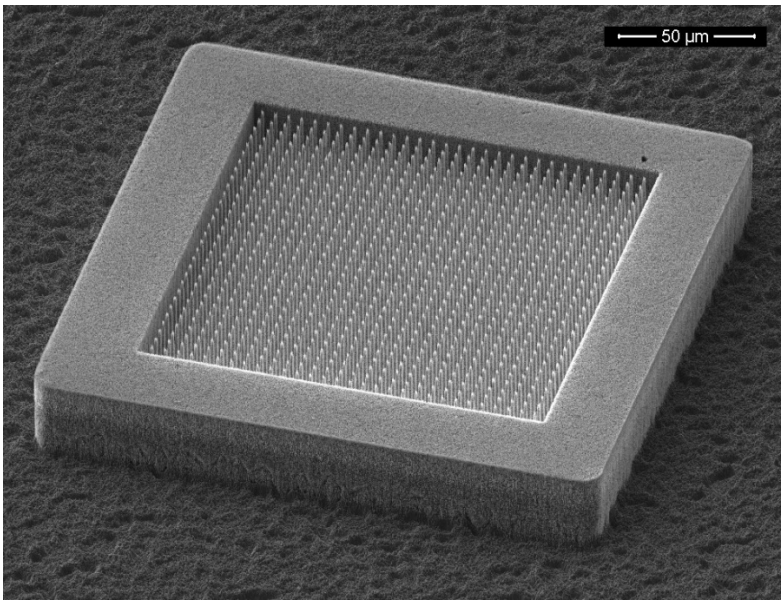
Applications like X-ray generation and electron microscopy depend on electron field emission, including the exciting field of vacuum nanoelectronics, which promises to improve computational power. To improve electron field emission efficiency, improvements in emitter density are required and carbon nanotube forests (CNTFs) have been increasingly investigated as a solution.

The sharper a field emitter apex is, the more current it produces with the same voltage, making CNTFs logical candidates for high density electron field emitters. The growth of CNTFs requires the use of diffusion barriers, most of which are electrically insulating. These resistive diffusion barriers impact device performance, requiring a higher field emission voltage.

A group of researchers at Hamburg University successfully attempted to resolve this by growing CNTFs on silicon and silicon nitride substrates coated with conductive titanium nitride (TiN). The TiN was deposited in an Arradiance GEMStar™ PEALD system. This approach resulted in an emission turn-on electric field decrease of up to 59%. CNTFs grown on TiN yielded improved high density electron field emitter arrays needed for vacuum nanoelectronics applications.



Highly conductive TiN films require byproduct-free vacuum conditions and careful optimization of the process, for which ALD is highly suited. For more information on GEMStar™ Technology, ALD systems or Foundry services, please contact Arradiance.

S. Haugg, et. al, *2023 IEEE 36th International Vacuum Nanoelectronics Conference (IVNC)*, Cambridge, MA, USA, 2023, p. 122, doi: 10.1109/IVNC57695.2023.10188947.