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Graphitic Nanoscale Channels Embedded in Amorphic Diamond Films

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Nanoscale manipulation of thin film has attracted much attention, owing to their possibilities to obtain new properties associated with nanoscale microstructure. A great effort is also focusing on the nanoscale manipulation of amorphous diamond (a-D) films which has the outstanding mechanical, electrical and tribological properties.

We demonstrate a novel technique to obtain a nanocomposite film where nanoscale columns of graphite phase are embedded in a amorphous diamond matrix. When using a Si substrate with nanosized Ni dots on the surface, graphitic columns grew selectively on the Ni dots, while a dense a-D film was deposited the bare Si surface. The growth of the graphite columns is closely related to the nanosized Ni dots that catalyze the graphite carbon formation in a filtered vacuum arc deposition condition.