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Growth of Nanocrystalline Graphite on Sapphire by Solid Carbon Source Molecular Beam Epitaxy

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We have grown nanocrystalline graphite on sapphire substrate by using solid carbon source molecular beam epitaxy. Changes of structure from amorphous carbon to nanocrystalline graphite controlled by the growth temperature have been investigated by Raman spectroscopy. Raman spectra show D, G, and 2D peaks, whose intensities vary on the growth temperature. Atomic force microscopy reveals that the surface is very flat. Sapphire substrates of different cutting direction produce similar results. Simulations suggest that the interaction between carbon and oxygen causes disorders. Electrical transport measurements exhibit a Dirac-like peak, including a carrier type change by an external gate voltage bias.

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