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A Novel Route for the Synthesis of Graphene by Microwave Plasma Enhanced Chemical Vapor Deposition ALEXANDER MALESEVIC, MANISH PAL CHOWDHURY, LIANG ZHANG, ANNICK VANHULSEL, CHRIS VAN HAESENDONCK — A novel route for the synthesis of graphene by means of microwave plasma enhanced chemical vapor deposition is presented. This technique outclasses its competitors in many ways since it is less elaborate and better reproducible than micromechanical cleavage of graphite and less expensive than thermal decomposition of silicon carbide wafers. Methane diluted with hydrogen is decomposed in a high power microwave plasma and the resulting carbon radicals recombine on the surface of any substrate that withstands temperatures up to 700 $^\circ$C. A broad range of substrates were successfully tested including silicon, quartz, stainless steel and many metals. The resulting carbon nanostructures are freestanding graphene flakes, only four to six atomic layers thick but up to several micrometers wide and high. The flakes are perpendicular aligned to the substrate surface. Thorough qualitative analysis lead to the conclusion that the flakes are highly crystalline sp2 carbon nanostructures with few defects or impurities. A possible growth scheme is proposed and field emission measurements of as grown flakes reveal a low turn on voltage of only 3V/μm which is a promising value for possible future applications.

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