**Presentation title in sentence case (bold) maximum of 20 words**

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The properties of VGN sheets can be tuned by the nucleation conditions such as the nucleation temperature and the growth duration [25], leading for different density of VGN forests across the substrates, with several topographies and oxygenated carbon edges. Such characteristics can also propose semiconducting behaviour for VGN materials for generating photo-induced electrons and holes that that may be worth during the photocatalytic mechanisms similar to defective and oxygenated semiconducting materials [26, 27].

In the present work, VGN sheets were nucleated on carbon fibres by the electron cyclotron resonance microwave plasma chemical vapour deposition (ECR-MPCVD) at different conditions. The morphology structure and defective measure of grown VGN sheets were controlled by varying the nucleation temperatures and durations. X-ray photoelectron spectroscopy (XPS) spectra of the carbon and oxygenous species chemical states provided more understanding into photocatalytic performance during the oxidization process. The impact of defective sites densities, roughness values of VGN samples was revealed and associated with their catalytic responses on the MB degradation under ultra-violet, and visible radiations. This work demonstrated the catalytic efficiency of pristine VGN sheets and the effective role of custom-designed of graphene materials, to tailoring their energy band gaps and physiochemical properties that can be utilized in novel applications.