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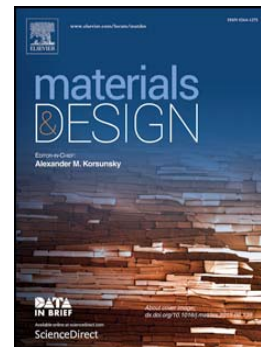
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**Solution growth of peony-like copper hydroxyl-phosphate ( $\text{Cu}_2(\text{OH})\text{PO}_4$ ) flowers on Cu foil and their photocatalytic activity under visible light**

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**Abstract:** Novel self-assemble peony-like three-dimensional (3D) copper hydroxyl phosphate ( $\text{Cu}_2(\text{OH})\text{PO}_4$ ) was synthesized on the copper foil by a solution-growth method. The self-aggregate peony-like 3D  $\text{Cu}_2(\text{OH})\text{PO}_4$  flowers with the diameter size up to 10 ~ 20  $\mu\text{m}$  were composed of hundreds of anisotropic cross-linking petals with several hundred nanometers wide and 110-170 nm thick. After the morphology and structure of these  $\text{Cu}_2(\text{OH})\text{PO}_4$  flowers were characterized by transmission electron microscope and scanning electron microscope, the possible growth process of  $\text{Cu}_2(\text{OH})\text{PO}_4$  flowers was proposed. The relationship between the shape of  $\text{Cu}_2(\text{OH})\text{PO}_4$  nanostructure and photocatalytic activity under visible light irradiation was also investigated. The results indicated that a thin petal and high content of  $\text{Cu}_2(\text{OH})\text{PO}_4$  flowers film on the copper substrate proved more convenient for extending their absorption edge to the visible light region, as well as giving a better photocatalytic performance.

**Keywords:** nanostructured materials; composite design; photocatalyst; energy materials; copper hydroxyl-phosphate; nanoflower

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