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Pulsed photoinitiated synthesis of reduced graphitic oxides-coated Co3O4 nanocomposite thin film for silicon-based micro-supercapacitor application SIJUN LUO, MOSES OGUNTOYE, BRILEY BOURGEOIS, JOSHUA SHIPMAN, NOSHIR PESIKA, DOUGLAS CHRISEY, Tulane Univ — Herein we report a novel approach to pulsed photoinitiated synthesis of reduced graphitic oxides-coated Co3O4 in-situ nanocomposite thin film on Cu-coated silicon substrate through pulsed white light irradiating photosensitive Co-organic precursor drop-casted on the substrate. The instantaneous photoinitiated pyrolysis of precursor occurred in the first pulse irradiation forms graphitic oxides-coated Co3O4 nanocrystalline composite thin film with a 3-D nanostructure. The subsequent tens of pulses irradiation with a fluence of 7.7 J/cm2 for about 40 seconds improves the crystalline quality of Co3O4 nanograins and leads to reduction of graphitic oxides through pulsed photothermal effect. After 80,000 times of stable charge-discharge cycling in KOH electrolyte (measured at 2 mA/cm2 in a three-electrode cell), the nanocomposite thin film with a thickness around 1 um shows unoptimized specific areal capacity as high as 50 mF/cm2 and rate capability of 60 % retention from 0.1 mA/cm2 to 10 mA/cm2. This straightforward and scalable thin film processing opens a way to practical application of thin film-based micro-supercapacitor in silicon-based microelectronics devices and microelectromechanical systems.

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