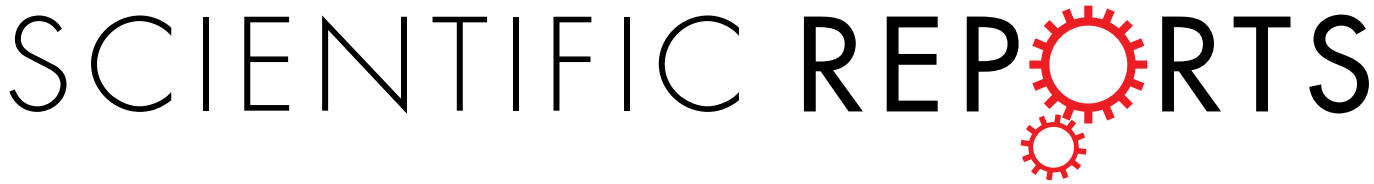

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Strong light scattering and broadband (UV to IR) photoabsorption in stretchable 3D hybrid architectures based on Aerographite decorated by ZnO nanocrystallites

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In present work, the nano- and microscale tetrapods from zinc oxide were integrated on the surface of Aerographite material (as backbone) in carbon-metal oxide hybrid hierarchical network via a simple and single step magnetron sputtering process. The fabricated hybrid networks are characterized for morphology, microstructural and optical properties. The cathodoluminescence investigations revealed interesting luminescence features related to carbon impurities and inherent host defects in zinc oxide. Because of the wide bandgap of zinc oxide and its intrinsic defects, the hybrid network absorbs light in the UV and visible regions, however, this broadband photoabsorption behavior extends to the infrared (IR) region due to the dependence of the optical properties of ZnO architectures upon size and shape of constituent nanostructures and their doping by carbon impurities. Such a phenomenon of broadband photoabsorption ranging from UV to IR for zinc oxide based hybrid materials is novel. Additionally, the fabricated network exhibits strong visible light scattering behavior. The developed Aerographite/nanocrystalline ZnO hybrid network materials, equipped with broadband photoabsorption and strong light scattering, are very promising candidates for optoelectronic technologies.

Hybrid nanomaterials in the form of combination of several components equipped with different individual nanoscale features are very important material candidates from an application point of view because, in hybrid form, most of the desired properties are accumulated together, often resulting in the occurrence of entirely new characteristics[1–4]. Due to multifunctional properties, hybrid materials are leading the trends in materials synthesis and application communities[1,3–7]. Looking on their future technological potentials, many new strategies for fabricating various hybrid nanomaterials are being introduced and accordingly investigations are continuing, but this field still has to come up with further cost-effective approaches which can offer simple and mass-scale fabrication of desired materials in appropriate hybrid forms. At the same time, it is also important to overcome the utilization complexities related to the requirement of nanostructure's integration on the micro-chip, e.g., focused ion beam, lithography, etc., have been mainly used to develop electronic devices based on individual

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