Solution Combustion Synthesized Iron Manganite Nanoparticles and their Implementation as n-type Photoactive Layer in Fully Inorganic p-n Heterojunctions Photovoltaics

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ABSTRACT

This study examines, for the first time, the synthesis and physicochemical characteristics of a temperature solution-processable monodispersed iron manganite nanoparticles via a combustion method using tartartic acid as fuel and show its performance as n-type photoactive layer for all metal oxide solar cells. $FeMnO_3$ is a semiconductor with an ideal direct optical band gap (~1.5 eV) to absorb photons, which is affluently consisted of eco-friendly elements [1]. It is shown that the combustion synthesis of perovskite $FeMnO_3$ using tartaric acid as fuel may be used to the ultimate control of the size of the nanoparticles (~13 nm) and yields compact and functional layers (~500 nm) by using a simple spin coating procedure [2]. Fully inorganic NiO/$FeMnO_3$ heterojunction photovoltaics were made by solution combustion synthesis using spin coating techniques [3]. The optoelectronic properties of the heterojunction were established. These solar cells demonstrate a high open circuit voltage of 1.31 V with sufficient fill factor of 54.3 % and low short circuit current of 0.07 mA cm^{-2} delivering a power conversion efficiency of 0.05% under 100 mW cm^{-2} illumination [4]. This work expands on the burgeoning of environmentally friendly, low-cost, sustainable solar cell material that derive from metal oxides.

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