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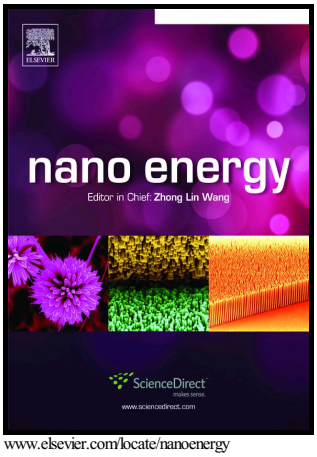

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Earth-abundant carbon catalysts for renewable generation of clean energy from sunlight and water

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Abstract: Water and sunlight are both renewable and readily available. A sustainable energy generation from water and sunlight holds a great promise to solve current energy and environmental challenges. However, low-cost, but efficient, catalysts are required. In this study, a rationally designed N,S co-doped three-dimensional porous graphitic network (N,S-3DPG) was used as a low-cost, highly efficient tri-functional catalyst to simultaneously catalyze hydrogen evolution reaction (HER) for photo-electrochemical water splitting to generate hydrogen fuel, oxygen evolution reaction (OER) for oxygen generation from water, and oxygen reduction reaction (ORR) for generation of clean electricity from hydrogen and oxygen gases in fuel cells. Based on the resultant multifunctional catalyst, the combination of photo-electrochemical water splitting, powered by $CH_3NH_3PbX_3$ perovskite solar