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Review

Potential of producing solar grade silicon nanoparticles from selected agro-wastes: A review

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ABSTRACT

The U.S. Energy Information Administration (EIA) stated that Nigeria generates around 3080 MW of electricity but with actual estimated demand of 10,000 MW. Due to the low electricity generation, total energy consumption profile of Nigeria showed that about 99% of the energy consumed is derived from fossil fuels which invariably contribute to greenhouse gases emission. Electricity, if readily available at low cost, can easily replace the fossil fuels which pose adverse effect on the citizen and climate. Solar photovoltaic is identified as an effective renewable energy source that has proven to be a promising candidate for provision of clean and sustainable electricity. Silicon is the leading commercialized terrestrial PV material for making solar cell due to its relative efficiency. This review work highlights the viability of using abundant agricultural wastes in Nigeria to produce nano-sized solar grade silicon employing methods that will require less energy. Details of previous silicon (nanoparticles) synthesized from agricultural wastes are dissected. Production of silicon nanoparticles from this origin could provide low cost solar grade silicon compared with high temperature robust methods currently been used to obtain them. Hence various methods of producing nanoparticles are highlighted.

Contents

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1. Introduction

Energy is very crucial to the sustainability of our societies (Chendo, 1994), without which life could be unconceivable with a lot of absence in our world. Its supply has been seen as future problem consequently drawing attention of all nations because human welfare in our modern life is intimately related to the quality and quantity of energy utilized (Hasan et al., 2012). As projected by several organizations, Fig. 1 shows the world electricity generation for more than two decades from 1990 which increases across the continents owing to people demand for more energy. Electricity distributed via national grids has been dominated by fossil fuels among the major sources of electricity which include coal, natural gas, petroleum, nuclear, hydroelectricity and renewables, as shown in Fig. 2.

Combustion of fossil fuels to unlock the energy stored in them has paved way for emission of greenhouse gases (GHGs) which contribute significantly to global warming (International Energy

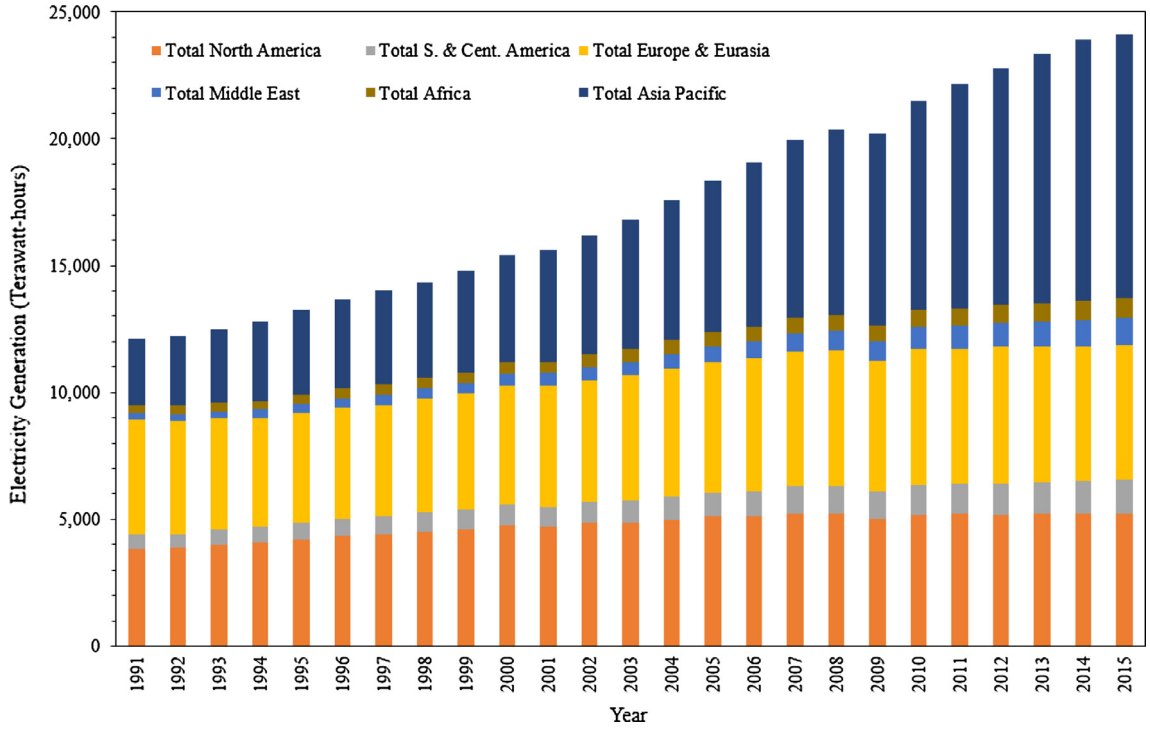

Fig. 1. World electricity generation in terawatts-h (data obtained from BP (2014)).

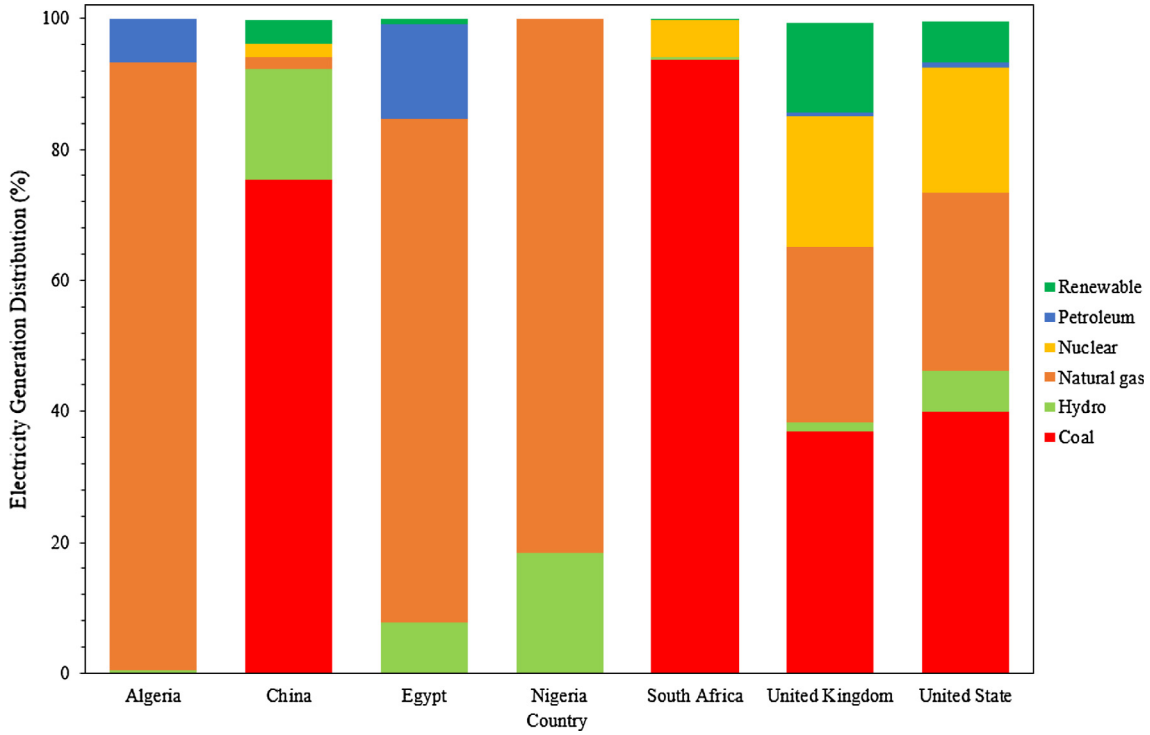

Fig. 2. Electricity production by source (extracted from World Bank (2011)).