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Research Article

BENEFITS OF LITHIUM MINING TO NIGERIA'S ECONOMIC DEVELOPMENT

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ABSTRACT

Lithium mining goes beyond the extraction of lithium ore; it involves the technological importance of the mineral together with its application. This refers to eco-friendly applications such as the production of electric cars, the production of lithium batteries for solar panels, and other electrical devices. Obtained lithium (spodumene) samples from visited mine sites in Gidan Kwano (Nasarawa State), Kokona (Nasarawa State), and Takushara (Abuja-Kuje LGA) were taken to the laboratory for analysis. The atomic absorption spectrometry result shows a lithium percentage that ranges from 1% to 4.5% (low to high grade). A statistical analysis of data for total production of lithium in a month (through interactive sessions with miners on-site) shows that over 20 tons of lithium can be produced in a month by an active lithium mine site. Conclusively, if 20 tons is used as the benchmark, this means that a total of 40 trucks worth ₦20,375,000,000 will be made per month and a total of ₦244,500,000,000 per year. With this amount of money, after the removal of various royalties, it can go a long way in handling various issues in the state, local government, and even at the federal level. Well-monitored lithium mining can create jobs for indigenous people in the community, and the financial contribution can increase the internally generated revenue. The production of electric cars in Nigeria will also help solve the issue of carbon emissions and create a friendly eco-system.

Keywords: Lithium, Spodumene, Electric cars, Financial contributions, Pegmatite.

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INTRODUCTION

New technologies and innovations translate to new ways of producing and consuming materials and energy sources. The sudden shift from the usage of cars that consume fuel to electric cars is a clear indication that man is evolving, and it also shows the need to help the eco-system in terms of reducing the emission of carbon into the atmosphere, which is the major driving during force for an eco-friendly system or application. In general, technologies are becoming more sophisticated, and products require the use of materials that are eco-friendly. Among these materials, metals have essential applications in technologies such as rechargeable batteries for hybrid and electric cars, permanent magnets for maglev trains, wind turbines, motors, and solar panels, Talens Peiro *et al*. (2013).

Even though such metals are used in low concentrations, demand has risen significantly, and consequently, their availability and potential recovery need to be considered, Talens Peiro *et al*. (2013). Although lithium has a low supply risk and there are possible substitutes depending on its applications, it is considered a critical metal due to its high economic importance.

Most of lithium economic importance are as follows:

i. As a material for the production of batteries for electrical devices, solar systems, and electric cars
ii. Lithium is the lightest and most highly reducing of metals, which confers on the battery having the highest gravimetric and volumetric energy densities (typically over 160 Wh/kg and 400 Wh/L), >50% of conventional batteries
iii. Lithium is a good conductor of electricity.

Countries in Africa, such as Nigeria and other African countries, must take the move into the usage of electric cars very seriously because the consumption of carbon from fuel-consuming cars and other domestic usage that affects the eco-system, leading to the depletion of the ozone layer, has led to an increase in radiation, which is felt from skin burns, and an increase in heat generated during the day.

DEMAND FOR LITHIUM MINERALS

The high demand for lithium minerals is a result of the increase in demand for the usage of electric-drive vehicles (EDVs). This drive for the use of EDV's came as a result of the need for the control of carbon emissions and also the need for an eco-friendly system, of which lithium batteries present themselves as most applicable. The current EDV demand projections may vary depending on the increase in demand by consumers. From recent projections in the demand for EDVs, the United States has been seeing a growing demand for EDVs. According to the projection, market share has reached over 9% of the total vehicles sold in 2017, as seen in Fig. 1. Sales of EDVs directly translate into demand for batteries, and in turn, lithium minerals. In terms of power capacity, to travel a 40-mile trip in an electric vehicle using a single charge, it would require 1.4–3.0 kg of lithium equivalent (i.e., 7.5–16.0 kg of lithium carbonate). The amount of lithium in the batteries of current EDVs ranges from 4 kg in a compact Nissan Leaf's battery to 63 kg in a Tesla Model S battery pack. To meet the current demand, the market share of lithium in rechargeable batteries has gone up from 0% in 1991 to 80% in 2007, according to Agusdinata *et al*. (2018).

Sources of lithium

The major sources of lithium are contained in brine lake deposits (also referred to as salars) and pegmatites.

From pegmatite deposit

The extraction of lithium in Nigeria is from a rich pegmatite deposit. Pegmatites are coarse-grained igneous rocks formed by the crystallization of magma at depth in the crust, Gruber *et al*. (2011).

Lithium is found in more than 145 different minerals, but it is extracted from the following types of lithium as seen in Table 1, while Fig. 2 shows the view of an observed pegmatite. Spodumene is the most abundant lithium ore, with a high percentage concentration of lithium.

From brine lakes

Lithium from brine lakes is obtained as lithium carbonate (Li_2CO_3) using the lime soda evaporation to dryness process. This consists