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Methods of Stabilising Lithium to Prevent Its Corrosion on Contact with Oxygen

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Abstract

The use of lithium in various fields has been immense, but its tendency to corrode when exposed to oxygen is troublesome. The study examines how lithium efficiency is affected by oxygen corrosion. Volatile organic compounds can cause eye irritation, allergic reactions, nausea, sickness and tiredness.

Keywords: Lithium, Oxygen, corrosion, Stabilization, Contact reaction

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I.INTRODUCTION

In this article, the ways of stabilising Lithium will be discussed [1]. Lithium is used in batteries for commercial applications, such as electric vehicles. If the existing working range of the batteries can be increased, it will impact the working range of the batteries in respective fields. The efficiency of Lithium's working is hampered by its corrosion, and therefore, our main aim is to prevent its corrosion.

2. OBJECTIVES

Lithium-ion batteries are highly erodible when they come into contact with oxygen. The causes for it have been identified, and the methods of prevention are shown below.

- To identify the main reason why Lithium causes erosion
- To find out the ways in which oxygen shortens the durability of Lithium
- To find out the causes to prevent the causes of corrosion
- To evaluate the ways in which Lithium can be erosion-free and use it in various fields, and increase the longevity of lithium-based technology
- To find out the ways Lithium can be reused and rechargeable
- To investigate the possible ways in which Lithium can be recycled

3.METHODOLOGY

The study in this article is based on scholarly articles from authentic sources. As it is a technology-based study, different articles based on technology have been taken into account, which is appropriate to this field [2]. The articles refer to different chemical experiments conducted to observe the reactions and changes of Lithium. They, for example, talk about how Lithium can be made corrosion-free to make its application in various Lithium-based industries possible. It has been noticed that this can be done by a very simple process of saturating electrodes with electrolytes for a time before using them in batteries [3]. However, the methods of using it in different industries and public sectors have been discussed based on experiments.

4. LITHIUM REACTION

Lithium is not highly reactive like other metals, but it has its own reactive potential. It burns if it is warmed up in the air, but when it comes into contact with oxygen, the flame is more severe. Lithium oxide, which is white in colour, is produced when Lithium comes into contact with oxygen. Lithium Nitride is produced when it comes into contact with Nitride in the air. Lithium highly reacts with water, subsequently producing Lithium hydroxide and highly combustible hydrogen. This uncoloured solution is intensely alkaline [4]. Lithium also reacts with carbon, which results in the production of carburet. Lithium also reacts with acetylene compounds, resulting in the formation of lithium acetylenes.

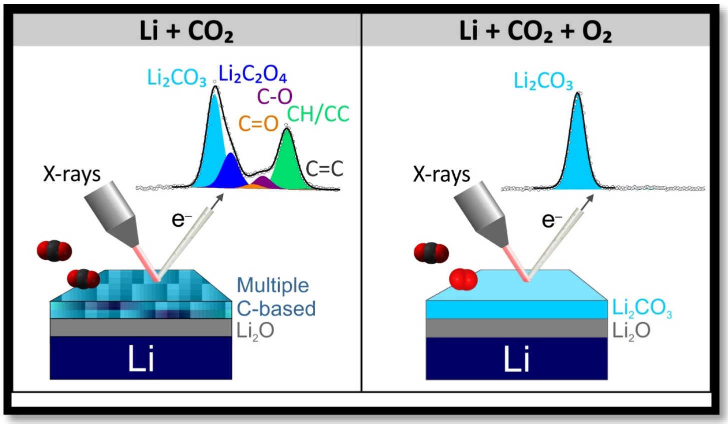

Figure 1: Lithium reacting with carbon and oxygen

5. OXYGEN REACTIVE TENDENCIES

Oxygen is highly reactive with other elements. Oxidation is a process in which Oxygen reacts with other elements to create one or two oxides. Oxygen reacts with both metals and non-metallic substances. Basic oxides are produced when metals come into contact with oxygen [5]. The chemical reaction that occurs during the Oxidation process is called, which is the elimination of oxygen from a material. Many metal ores contain oxides. The original metal can be extracted from it by reduction.

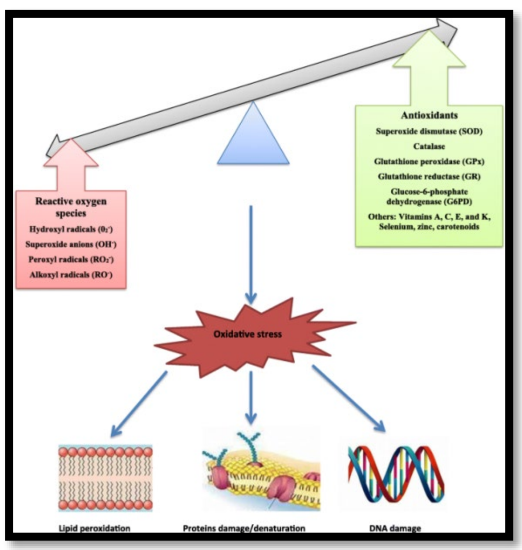

Figure 2: Oxidising effect on the different elements

6. AIR REACTIVE ELEMENTS

One of the most reactive elements in the air is oxygen. This is found plentifully in the air and also in human bodies. Many gases that constitute the air, for example, surface ozone, oxidised nitrogen compounds, volatile organic compounds, and nitrogen dioxide, react with the air. Ozone can react with sunlight and many other chemicals in the stratosphere [6]. At every step, different chemical compositions are produced. The study of the reaction of these elements is not sufficient till now, and further studies are going on.

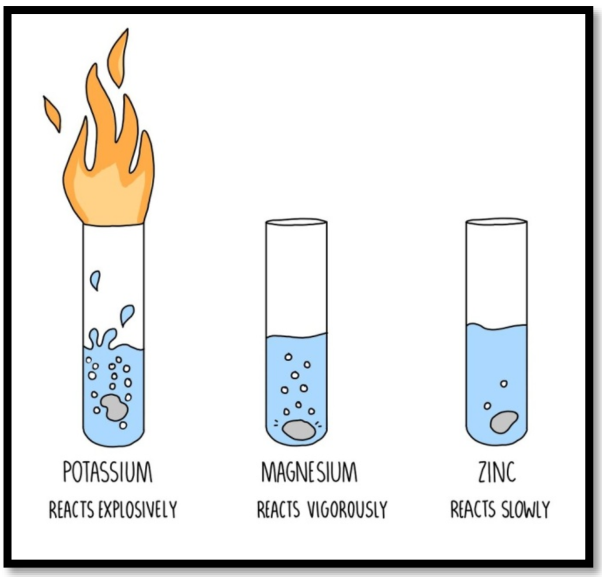

Figure 3: Oxygen and Hydrogen in air reaction

7. LITHIUM AND OXYGEN

Lithium is combustible and can catch fire if warmed up. In reaction with Oxygen, it produces Lithium Oxide (L.O.), which is white in colour. The blaze becomes more extreme when it comes into contact with pure oxygen [6]. L.O. is a chemical composition formed between a metal, such as Lithium, and a non-metal, such as oxygen. Lithium reacts when it comes into contact with Nitrogen in the air and produces Lithium Nitride. Lithium is a light element, and it is found mostly in the upper atmosphere.

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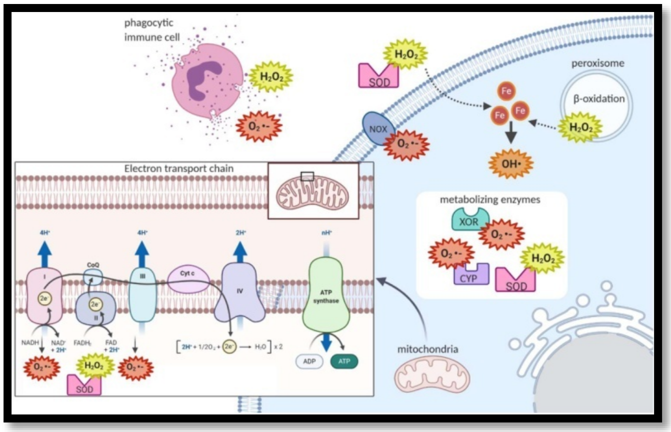

Figure 4: Oxygen reacting with Lithium due to the above reaction

(Source: Influenced by 7)

8. STRATEGIES AGAINST LITHIUM CORROSION

Corrosion of Lithium must be addressed in order to put it to human use. It is used in high-energy batteries. Lithium is prone to environmental erosion, which is a natural process. Lithium Plating can be avoided by keeping away from overvoltage during charging, and other hazards associated with charging and disconnecting the charger at low temperatures. There are ways to safeguard Lithium battery terminals. It is important to cover each battery or battery-powered device in a wholly enfolded covering [7]. Lithium has a tendency to accumulate in the form of a white dendrite. This formation is the subsequent process of the unequal deposition of Lithium. This hinders the possible extensive usage of Lithium batteries in different fields. The problems that Li faces can be solved by forming an outer barrier or restricting Li in the source of origin.

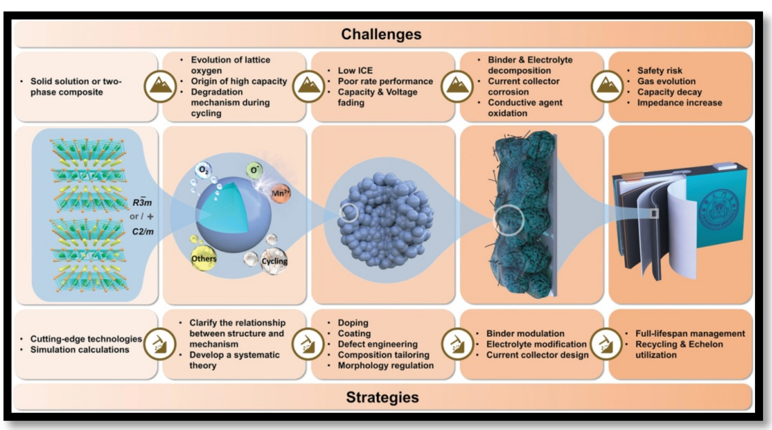

Figure 5: Challenges faced in the corrosion process due to different elements

9. STABILIZING LITHIUM

The tendency of Lithium to grow dendrites is a major obstacle in using Li metal batteries. To extend the Li battery life, a lot of strategies have been adopted before, for example, replacing metal with alloy, improving the electrolyte components and many others [8]. A solid complex cover can be formed on the outer layer of the Li plate. This covering will not only help in the equal Li sediments but also help in producing the polymer.

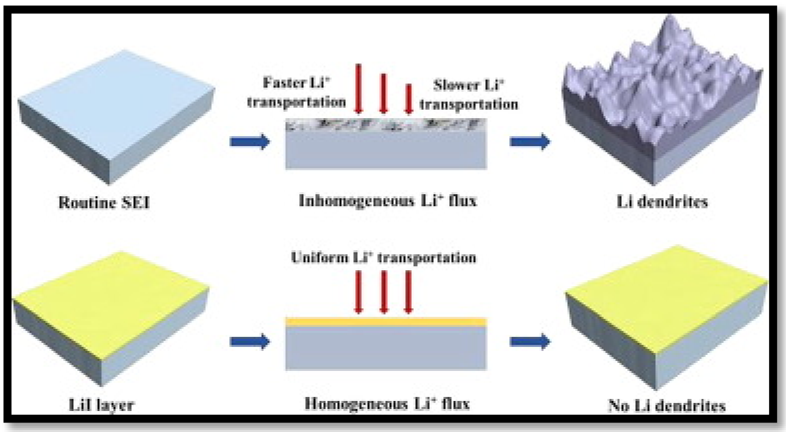

Figure 6: Iodised Layer to have lithium stabilization

(Source: Influenced by 9)

10. PROBLEM STATEMENTS

This article is based on sufficient evidence found after chemical experiments. There is still a gap between the problem and the need to address it [9]. The study of the reactions of the chemicals is not sufficient. The study on how Li reacts with other chemicals is a little limited, too.

11. CONCLUSION

It is concluded that the usage of Li in practical fields faces a lot of hindrances. These obstacles need to be challenged to fully optimize the use of Li batteries. There are ways to cope with these challenges, like forming an outer barrier and many others. Studies have been going on in this field to put Li to use.

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