

# Graphene-Supercapacitor



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## **CERTIFICATE**

It is to certify that this project report entitled, “**Graphene-Supercapacitor**” is based upon the results of experiments carried out by Haseeb Niazi, Azhar Shabbir and Sharib Jameel under my supervision. No material has been used in this report which is not their own work except where due acknowledgment has been made. They have fulfilled all the requirements and qualified to submit this report for the Degree of BS- Industrial Engineering.

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## **Abstract**

The evolution of human interactions and work activities is quite revolutionized in about last 2 decades. The world has turned digital in almost every aspect of life. With it, came many challenges and errands to accomplish. The most essential component of this digital world, is quite modestly behind the walls of concealment. Batteries that enable us to turn as many devices as we want; into portable ones and make us feel quite handy about so many tasks a day. That is also the area in which the major lagging of revolution is found, as the best battery (Lithium Ion) of the age is subjected to catch fire or even catch fire under high temperature conditions and possess limited performance properties. Here comes the most feasible startup idea of innovating energy storage. The best bet turned out to be recently commercialized material, graphene. The super-capacitor made of graphene shows some overwhelming performance characteristics.

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## Introduction

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## **Background**

Most historians date the development of battery at the end of 18<sup>th</sup> century by an Italian physician 'Luigi Galvani'. This technically was a clay jar with iron rods surrounded by copper cylinder, and which produced a low 1.1 voltage, when filled with vinegar. Hans Wilhelm Koenig believed this the real origin of ancient battery.

Since the advent, the development of batteries leaned on, just like any other useful device in the past. Eveready, known for his invention of flashlight (and portable battery), started selling alkaline batteries which were enough to power portable radios, toys and remotes these days. But later, with the invention of lithium batteries, a new world was born with long lasting power capabilities for high tech devices like hand held computers, from music players to handheld computers. Which nowadays seem to be outdated for its limited capabilities like low power density, long charging and all.

The ongoing literature encompasses the era for battery development from:

**1700**