Production of Nano-Supercapacitors Using Nanoparticles (a Piezoelectric and Ferroelectric Material)

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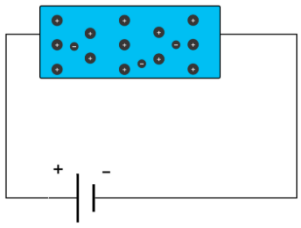
- **Abstract:**

Note : Nano-supercapacitors are made using nanoparticles that can be polarized so that electrical energy can be stored. Nanostructured multilayer technology (solid state) is a well-known dielectric material used in nano-supercapacitors because it is a piezoelectric and ferroelectric material. In this work, they provide storage capabilities between different types of these electrical nano-layers by creating passive filters.

- **Keywords :** Nano-supercapacitors , nanoparticles , supercapacitors , Nanoelectronic

Introduction •

The electrical properties of solid materials (nano-supercapacitors) are very diverse. Based on the resistance of (nano-supercapacitors) to the passage of electric current, different materials can be classified into conductors, semiconductors, and insulators. While in superconductors there is a different mechanism for conducting electrons. The electrical conductivity of a (nano-supercapacitor) can be attributed to the number of free electrons that move freely in the material under the influence of an external electric field, as well as mobility, which is a measure of the ability and speed of movement of free electrons.



Dielectric or electrical insulation properties in (nano-supercapacitors)

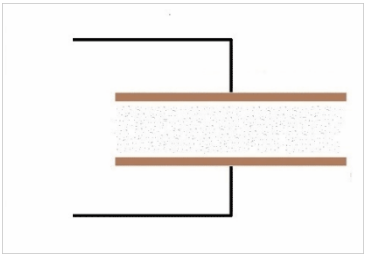
In (nano-supercapacitors) , the dielectric is an electrical insulator that can be polarized by applying an electric field . In the structure of (nano-supercapacitors), the ideal dielectric has no free charges. When a dielectric is placed in an external electric field, the induced free charges that move towards the surface in the conductors and make the charge density and internal electric field zero, no longer exist. However, since the dielectric (nano-supercapacitors) has a bound charge, it cannot be concluded that they have no effect on the electric field placed in it.

Piezoelectric effect or electric pressure effect in (nano-supercapacitors)

One of the unusual properties that some nanosupercapacitors exhibit is the piezoelectric effect . By applying an external force, the dipoles of these nanosupercapacitors are excited, creating an electric field . Reversing the force (for example , from tensile to compressive) reverses the direction of the field.

Pyroelectric effect or electric pressure effect in (nano-supercapacitors)

Pyroelectricity is a phenomenon in which a material produces electricity when heat is applied to it. This phenomenon is different from the thermoelectric phenomenon in (nano-supercapacitors) . Changing the temperature slightly changes the atomic position in the crystal structure, so that the polar state of the dielectric material (nano-supercapacitors) changes. This polar change causes an increase in the voltage in(nano-supercapacitors) .



Production of nano-supercapacitors using nanoparticles that can be polarized in such a way that electrical energy can be stored. Nanostructured multilayer technology (solid state) is a well-known dielectric material used in nano-supercapacitors because it is a piezoelectric and ferroelectric material. In this work, by creating passive filters, they provide storage capability between different types of these electrical nano-layers.

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