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# A REVIEW PAPER ON THE ANALYTICAL STUDY OF POLYDIMETHYLSILOXANE (PDMS) WITH ITS PHYSICAL AND CHEMICAL PROPERTIES TOWARD THE VERSATILITY

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## ABSTRACT

Polydimethylsiloxane (PDMS) is one of the most eco-friendly organosilicon materials with high demand in today's advanced technology. PDMS is also known as Dimethicone or Dimethylpolysiloxane and usually referred to as Silicones. The general chemical formula for Silicone is (R2SiO)n, where R is the alkyl group. From the chemical equation, it's clear that silicone is the repeating structure of siloxane. When silicon (Si) is bonded with oxygen (O) atom as well as two methyl groups (CH3) then the siloxane is structured. Polydimethylsiloxane (PDMS) is introduced with versatile application in biomedical and electronics industries for its eye-catchy, unique and promising properties such as flexibility, optical transparency, water-resistance nature, biocompatibility, gas permeability, non- toxicity, enhanced electrical conductivity, and low fabrication cost [1-2]. It is used in numerous fields like electronic devices, oil separation devices, medical equipment, macro-mechatronic devices. In this paper, we will try to make a collective study of Polydimethylsiloxane (PDMS) with its physical and chemical factors that can be highlighted its industrial versatility. Electrically conductive PDMS has drawn huge interests in many applications such as energy storage, batteries, electromagnetic shielding, flexible displays, and smart sensors [3]. However, the intrinsic brittleness of conducting conjugated polymers and moderate electrical conductivity of engineering polymer/carbon composites have highly constrained their applications. Intrinsic PDMS is non-conductive and its volume resistivity is 2.9E14 ohm-cm [4]. Conductive PDMS, in particular PDMS composites, has also been suggested as flexible electromagnetic interference shielding which can surpass the best values of metals and other carbon-based composites [5]. Using of different techniques like Differential Scanning Calorimeter (DCS), X-Ray Diffraction (XRD), Transient Plane Source Method (TPS), Dilatometer (DIL), etc we can measure the different thermal and mechanical properties like specific heat capacity, crystallization property, thermal conductivity and hardness property of PDMS at different temperatures.

Form the analysis of both physical and chemical properties of Polydimethylsiloxane (PDMS), we can establish the relation between the energy produced due to the flow of electric current and the energy required to break the chain of the polymer. From the computational study of the condensation of Polydimethylsiloxane using MeDeA – VASP, we collected the activation energy in the time of the bond break. So, in this work, we also compared the value of activation energy for the condensation and the value of activation energy due to the energy for the electrical current.

**Keywords** Polydimethylsiloxane (PDMS), Activation energy, Physical and Chemical Properties, Application, Electrical current effect.