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Review on the advantages of polymer based batteries

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Abstract: : *This reviewed article reports, the discussion on new generation battery material. This polymer based battery materials is different from conventional Li-ion battery. It shows more efficiency, durability, flexibility, high power densities, high efficiency and a lot advantage over the Li-ion batteries. Polymer based battery materials should be the better alternative anodes for high performance lithium-ion batteries.*

Key Words: *Polymer; Lithium; Electrode; Battery.*

1. INTRODUCTION:

Recently, battery is most essential part in daily life. The daily life is completely depends on batteries from smallest battery like coin cells to batteries for watch, torch, mobile phones, laptops, as well as batteries for vehicles. Moreover, batteries for electric vehicles like bike, cars, buses, trucks as well as energy storage batteries. This demand is not accomplish by a single type of battery, it need different types of batteries. Because of this reason, each and every demand have need of different size and capacity of battery. So, each battery needs different chemical composition. In last decade polymer based batteries get more attention as compared to Li-ion batteries. The polymeric materials replace the use of metal in electrodes which results in enhancement in battery applications. The redox-active polymeric material is used as active materials for battery. These materials enhanced the life and efficiency of battery. The Li-ion batteries have some limitations like natural resources, mechanical robustness, electrochemical performance, environmental issues, and cost. So, in recent years these batteries are outdated and polymer based batteries taking advantage over it. Because of their advantage such as capacities, fast redox kinetics, structural design ability, low cost, potential cheapness, and environmental friendliness also possess good processability and mechanical flexibility. Old generation batteries use metals as redox-active materials but these batteries are based on organic materials as the active parts within the electrodes. Due this up gradation properties like flexible batteries fabrication, high power densities, high efficiency and many more are held by these fabricated batteries [1-15]. So that recent researchers have more research interest in polymer based batteries which have high commercial interest. Therefore, in this article the polymer based battery materials are reviewed.

2. RESULTS AND DISCUSSIONS:

This section based on the discussion on experimental technique and results reported by various researchers. Zhang et al. synthesized triphenylamine-based microporous organic polymers with high surface area were employed as cathode materials for lithium ion batteries. The materials were characterized to confirm the formation of expected material through Fourier-transform infrared spectroscopy (FT-IR) spectrum of OPTPA, thermal properties like TG/DTA to confirm the thermal stability, the porosity of OPTPA, SPTPA and YPTPA was determined by nitrogen adsorption and desorption at 77.3 K, volumetric adsorption analyze .The microscopic features of the sample was done on a field emission microscopy (HRTEM) and scanning electron microscopy (SEM) high-resolution transmission electron microscopy to study the surface properties. It reveals excellent results like the high discharge capacity, excellent rate performance, high stable cyclability and high energy density. Author expected these porous organic polymers based battery materials could be capable for the fast charge discharge cathode materials of lithium ion batteries [16]. Kanga et al. reported the synthesis of photocured PEO-based solid polymer electrolyte as well as its application to lithium-polymer batteries. Moreover, the materials reveal the tremendous results. The reported materials show the maximum conductivity value was 5.1 S/cm at room temperature. Also, the reported electrolyte materials represent the oxidation stability up 4.5 V as compared to lithium reference electrode [17]. Sha et al. synthesized graphene/chemically-

crosslinked PMMA (Gr/c-PMMA) composites in the presence of GO as alternative anodes for high performance lithium-ion batteries. The prepared material was characterized via Scanning electron microscopy (SEM) for surface study, Fourier transform infrared (FT-IR) spectra, X-ray diffraction (XRD) analysis for structural confirmation, Thermogravimetric analysis (TGA) was measured on at 10°C min-1 under an Argon atmosphere for thermal stability investigation. Also, X-ray photoelectron spectroscopy (XPS) analysis was carried out. It reports the Gr/c-PMMA anode provides a large capacity of 206 mAh g-1 at 20 mA g-1, and retains 167 mAh g-1 at a high rate of 400 mA g-1 [18]. X. Yue et al. explored the synthesis via cationic radical polymerization, characterizations and application of two composite materials such as supercapacitor carbon (SC) loaded with poly [2,3-bis (2-pyridinyl)-5,8-bis (2-thiophenyl) quinoxaline] (PPTQ) or poly [2,3-bis (2-pyridinyl)-5,8-bis (2-(3,4-ethylenedioxythiophene) quinoxaline] (PPETQ). The reported material had good electrical conductivity and delivers much more active sites for the lithiation/delithiation redox process due to its honeycomb porous structure [19]. Number of researchers had reports there research articles for the study of polymer based battery materials. But, in this review article some articles are discussed on the basis of their performance ability, characterization methods, and material selection. These articles contain good material selection as well as reveals better results to replace conventional battery electrodes.

3. SUMMARY:

The conventional battery electrodes/materials could be replaced by the polymer based composites. Reviewed articles shows the good results of prepared materials which could replace the old generation battery materials with more efficiency, higher charge density. The reported polymer based materials better efficiency as compared to conventional battery materials.

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