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Abstract

Recent Advances in the development of supercapacitor componentsemploying nanocellulose based polymer composites

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Abstract:

With rapid fossil fuel consumption and ecological concerns, alternative options of green energy development and its efficient storage technology is an emergent area of research. Nanocellulose (NC) is observed a very-promising, sustainable and environmentally friendly nanomaterial for green and renewable electronics for advanced electrochemical energy conversion/conservation devices. NC has high strength, modulus, and aspect ratio. It is stable in most of the solvents and the stability has wide electrochemical window. Hence it can be used as a separator, electrolyte, or binder material also. The nano-order scale of NC offers a very high surface area that assists in controlling the pore structure in separators. It offers a perfect diffusion path for an electrolytic solution and facilitates the transport of ions. If used as an electrode, NC provides mechanical strength and flexibility to such electrodes (films or aerogels) and offers very high surface area that improves its capacitive performance. Conductivity of such an electrode can be increased by loading it with conductive carbonaceous materials like CNTs, graphene oxides (GO) etc.

The pore size and its distribution in NC affect the electrolyte uptake, ionic conductivity and hence the performance of supercapacitor. It is very much required to control these parameters and prevent the collapse of the web structure of NC for improved performance in energy storage systems in 2D structures. To impart flexibility to the electronic storage systems, the processing route to be selected must be the one that can maintain the high aspect ratio of the NC. Solvent casting, filtration methods maintain the aspect ratio of the NC but are not industrially viable techniques. On the contrary, extrusion and film making can be a commercial method provided an in-depth analysis of the effect of various processing parameters on the properties of resultant nanocomposites is done. Aspect ratio of the melt processing technique is found lesser compared to laboratory techniques.

Biography:

Dr. Sandeep Ahankari is working as an Associate Professor in the School of Mechanical Engineering at VIT University, Vellore, TN, India. He is basically a mechanical engineer, pursued his PhD from IIT Kanpur, India in the area of functionally graded polymer composites and postdoctoral research at University of Guelph, ON, Canada. His area of interest includes- Processing and thermo-mechanical characterization of bio/polymer nanocomposites, functionally graded composites, etc. He has nine international journal papers, twenty international conference papers, five international book chapters to his credit. He filed five patents and one invention of which three are granted.

Recent Publications:

1. Ahankari Sandeep Sureshrao et al; OPTIMIZATION OF RISER NECK FOR ALUMINIUM CASTING BY USING SIMULATION TOOL, 2020.
2. Ahankari Sandeep Sureshrao et al; Nanocellulose based polymer composites for energy applications—A review, 2020.
3. Ahankari Sandeep Sureshrao et al; Sea Water Effect on Mechanical Performance of Steel Pipes Rehabilitated with Glass Fiber Reinforced Epoxy Composites, 2020.
4. Ahankari Sandeep Sureshrao et al; A Continuous Sustainable Progress for Realistic Attainment of Program Outcomes (POs): A Case Study, 2018.
5. Ahankari Sandeep Sureshrao et al; Comparative Damage Analysis of Impact Induced Traditional and Graded Filament Wound Glass Fiber/Epoxy Composite Pipes, 2018.

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