Energy storage devices constructed with electrodes consisting of paper and conducting polymer composites

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Applications that require energy storage devices are becoming increasingly diverse, ranging from portable and disposable electronics to stationary and large-scale power back-up. These applications set different demands on their energy storage devices and as a consequence there will be no single technology that will be used for all systems.

In a future sustainable society, it is of key significance to consider all environmental aspects of materials including production, usage as well as disposal at end-of-life.

Conventional batteries rely on the use of non-renewable inorganic materials, mined from steadily depleting ores and that require large amounts of energy for their processing.[1] Conducting polymers, on the other hand, constitute a class of materials that can be used for organic matter based- and biodegradable materials for electrochemical energy storage.[2]

The Sustainable Development Goals set by the United Nations General assembly in 2015 acknowledge the importance of innovation and partnership to reach the targets.[3] Dow Jones Sustainability World Index ranks BillerudKorsnäs as the industry leader within the category Packaging and Containers for the second consecutive year.

In a unique collaboration Uppsala University and BillerudKorsnäs are developing electrode materials from paper and conducting polymers. Apart from being electronically conducting, it is possible to oxidize segments of the polymer chain. This results in an electron deficiency on the chain which is charge balanced by the incorporation of ions. Since the polymer consists of numerous repeating segments, it is possible to oxidize each chain more than once. These oxidations are reversible and it is possible to utilize them to store energy in the polymer in combination with various electrodes.

This presentation focusses on energy storage devices constructed with electrodes consisting of paper and conducting polymer composites and describes its' current status, challenges, and possibilities.

References

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