SEMINAR סמינר

Development of Carbon Fabric as a Lightweight Highly Conductive Current Collector for Li-ion Battery

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Due to their high energy density and long cycle life, Li-ion batteries are powering portable electronic devices. On one hand, there is a substantial interest to increase the energy density of Li-ion batteries, while on the other hand, there is a growing need for a battery flexibility and shape adaptation. In commercial Li-ion batteries, the active materials are coated onto metal foils current collectors. The copper anode current collector is considered as a heavy one, and a rather costly component. Along with other non-active components added in the electrode assembly and composition the total energy density of the battery decreases. Therefore, the development of a lightweight current collector can substantially improve the energy density of the battery.

In this research, advanced and modified carbon nanotube (CNT) fabrics are studied as an alternative anode current collector to copper. CNT fabrics have significantly lower densities than copper (~0.2-1 g cm^{-3} vs 8.9 g cm^{-3}) and can be in principle very thin, flexible, highly conductive and inexpensive. Two techniques are demonstrated to prevent high values of charge losses at the first charging of the cell: (a) using very thin ultra-light CNT fabrics and pre-treating them with IPA or (b) using CNT fabrics with copper electrodeposition on both sides of the CNT fabrics' surface. The electrochemistry of the CNT fabric is evaluated in two copper electrolytes: acidic copper sulphate and alkaline complex copper pyrophosphate, a thin copper layer is deposited on the outer surface of the CNT fabric and the obtained Cu-CNT-Cu structure is examined as the current collector. Battery cells are assembled and it is shown that the electrochemistry of the graphite MCMB anode material remains unchanged for both techniques. Nonetheless, due to a substantial reduction of up to 98% of the current collectors' weight, the gravimetric energy density is significantly improved.

Supervisor: Prof. Yair Ein-Eli

ההרצאה תתקיים ביום ראשון, ה- 10 בינואר 2016 בשעה 14:30

באודיטוריום ע"ש דיויד וואנג, קומה 3, בנין דליה מידן

The lecture will take place on Sunday, January 10th, 2016 at 14:30,

David Wang Auditorium, 3rd floor Dalia Maydan Bldg.

כיבוד קל יוגש לאחר הסמינר