Influence of the Network Density on the Performance of Organic Batteries based on Triphenylamines

Organic battery materials have attracted great attention in energy storage in recent years. Since the sustainability of the inorganic materials commonly used in batteries is an issue, the replacement of those becomes essential. Employing organic materials as electrode materials has turned out to show promising advantages such as mechanical flexibility, tuneable properties, sustainability and safer handling.[1]

Several triphenylamine (TPA) derivatives containing one (F=1) or two (F=2) cross-linkable oxetane group(s) with varying molecular chain lengths (C6/C2/C0-spacer) were designed. The resulting monomers were processed in different average functionalities ($1.0 \leq F \leq 2.0$) as a slurry mixed with carbon black (CB) and cross-linked *via* a solid-state cationic ring opening polymerization (CROP). Coin cells were fabricated testing the various cathodes with a Li-metal anode where all showed a potential of ca. 3.5 V.

Moreover, first results have shown that the network density and the relative discharge capacity is stronger affected by the linker length than by the degree of cross-linking. However, a utilization of >99% for TPA-C6 as cathode material could be reached indicating that the TPA derived molecules could be promising candidates as cathode materials in organic batteries.

[1] B. Esser et al., *Journal of Power Sources,* 482 (2021) 228814.

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