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Project title:	Production of electrically capacitive tri-component fibres by addition of graphene in the melt spinning process (FiberCap)
Partners:	ITA of RWTH Aachen (single subsidy)
Run-time:	01.04.2017 – 31.03.2019
Conveyor:	Deutsche Forschungsgemeinschaft

Mission Statement

The digital revolution of the 21st century has made the development of intelligent electronic technologies one of the key scientific challenges. This also applies to the development of textiles with additional electronic functions, so-called 'smart textiles'. Such textiles require lightweight and high performance energy storage systems that are incorporated into clothing. Sewing in batteries is not expedient here, since the bulky nature of such charge storage drastically reduces wearing comfort. One solution are supercapacitors consisting of an electrolyte layer with two electrodes, which are connected to a current collector. Fibre-based supercapacitors in which the electrode material is integrated into the fibre or adsorbed to the fibre by chemical functionalization have capacities in the order of several hundred F / g with a fibre diameter of less than 50 microns, so by bundling multiple fibres into one Filament yarn, the capacity of the previously available supercapacitors could be exceeded by several orders of magnitude.

Solution path

The aim of the research project FiberCap is the development of electrically capacitive coaxial fibres with a capacity of 100 mF / g by the addition of graphene in the melt spinning process. For this purpose, the structure of conventional supercapacitors consisting of electrode, electrolyte and current collector is transferred into a core-shell fibre geometry. The core component of the fibre to be developed consists of polyamide 6, which is modified with carbon nanotubes and conductive carbon black (carbon black / CB) to provide electrical conductivity. As a shell component, graphene-modified polyamide 6 is spun together with an ionic liquid which acts as an electrolyte. The ionic liquid used is ethyl ammonium nitrate (EAN). In the

figure below, the supercapacitor to be developed is shown schematically.

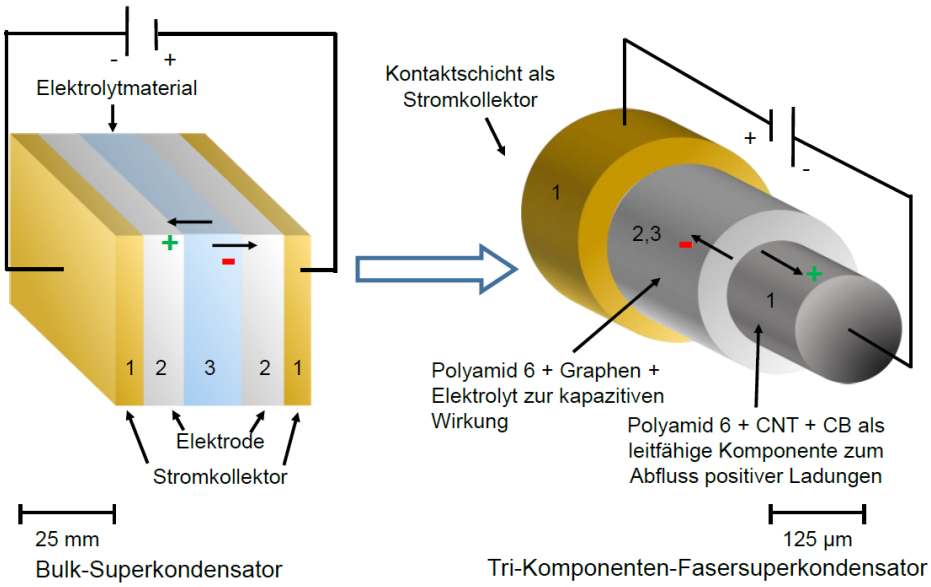

Figure 1: Fibre-shaped realization of a supercapacitor

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