Electrically conductive coatings with carbon nanotubes for smart textile applications

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A textile coating with variable amounts of carbon nanotubes CNT was developed with high performance properties. Formulations of textile coatings were prepared with up to 15 wt % of CNT, based on the solid weight of the binder. As binder material water based polyacrylate and polyurethane dispersions were used. The CNTs were mixed into the binder dispersion starting from a commercially available aqueous CNT dispersion that is compatible with the binder dispersion. A high degree of dispersion could be visualized by electronic microscopy imaging. The CNTs are creating a structured and open network inside the coating layer. At 10wt% of CNT, the network is complete and this results in the lowest sheet resistivity value. The coatings showed increasing electrical conductivity with increasing CNT concentration. The coatings can be regarded to be electrical conductive (sheet resistivity $<10^4$Ohm/sq) starting at 4 wt% CNT.This type of coating is suitable to introduce electrical conductivity in textile applications where high performance properties are needed. Different textile based prototypes with high and low conductive coatings were developed: anti-static covers, capacity sensors and heating elements. Textile materials with integrated electrical conductivity make it possible to create intelligent articles with sensors, lighting and heating without losing the basic properties of a textile, i.e. light weight, stretchable and flexible, large contact area, comfortable and ease of use.