Motivation
The technological progress in the field of micro- and nanotechnology allows promising possibilities for new sensors and sensor principles, which will play a key role in future. For example carbon nanotubes (CNTs) have unique electrical and mechanical properties which involve interesting advantages for sensors, such as a short reaction time, a higher sensitivity and enhanced measurement sectors. Novel sensors with outstanding performance can be realized using Multi-Walled and Single-Walled CNTs in different technologies and allowing the measurement of versatile measurement quantities. At MST and in cooperation with the Center of Micro-technologies different activities are running aiming to demonstrate the benefits of CNTs for sensors particularly for mechanical and optical measurement quantities. For example CNT films have been realized for use as strain gauges. They can be manufactured in different forms, show a high sensitivity and can be applied without adhesives.

Advantages of CNT’s
- mechanical sensors
- pressure
- strain...
- functional groups: enzymes, molecules...
- optical sensors
- emitter
- detector
- biological and medical sensors
- DNA
- RNA

Processing
A plastic film was covered on the PS substrate and the inner part of it was then got rid of. CNT suspension was dripped into the oblong slit. The CNT film was ready after 24 hours air-dry in the clean room.

Influence of Processing Parameters
- The sonication time plays an important role for the quality of CNT films.
- The homogeneity of CNT films was improved by suitable sonication time.
- Resistance values of MWNT films are inversely proportional to the quantity of the MWNT used.

U-I characteristic curves of specimens made from 0.1 wt%
MWNT suspensions prepared with different sonication time.
- Temperature dependence of resistance of one specimen made from 0.5 wt% MWNT suspension.
- Annealing can significantly reduce the resistance values of CNT films.

Experimental Results
- MWNT-Specimens produced by using DOC show a higher fluctuation of the relative change in film resistance with the applied strain than the specimens produced with SDS.
- Specimens made from MWNT-PEO composite show a higher gauge factor than pure MWNT-specimens.

Conclusion
Strain gauges based on MWNTs and MWNT-PEO composite realized a higher sensitivity than commercial metallic strain gauges. Relevant processing parameters such as sonication time, CNT weight fraction and annealing process are investigated to find the influences on electrical properties of produced CNT films. Sonication time plays an important role for the quality of CNT films. It realizes a better homogeneity and specimen spreading can be significantly reduced. Polymers like Polyethylene Oxide as well as different surface surfactants, such as SDS: Sodium Dodecyl Sulfate and DOC: Deoxycholic Acid and sodium salt, can be used realizing different properties of produced strain gauges. An exponential relationship between the relative changes in film resistance and strain was found.

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