



- 1 *Transparent, conductive film on a stretchable substrate.*
- 2 *Application in conjunction with tablets.*
- 3 *Industrially produced ECO TOUCH rolls.*

DISPERSIONS FOR TRANSPARENT, FLEXIBLE ELECTRODES

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In collaboration with



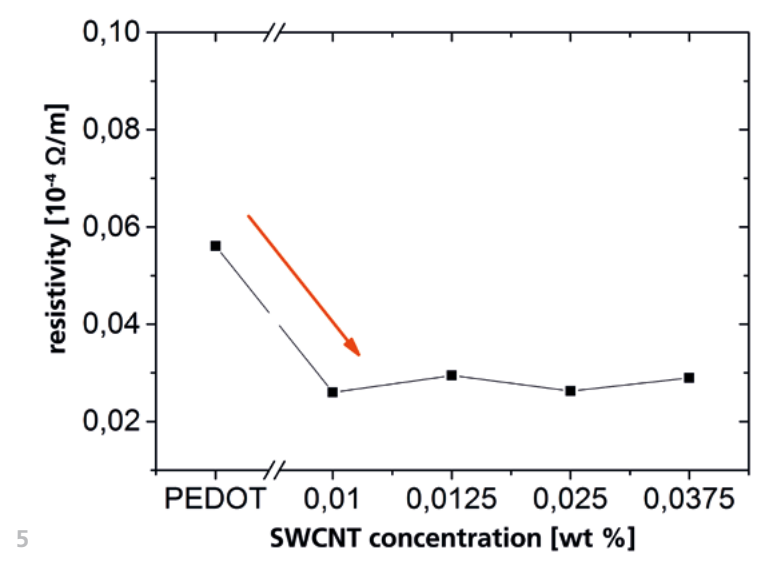
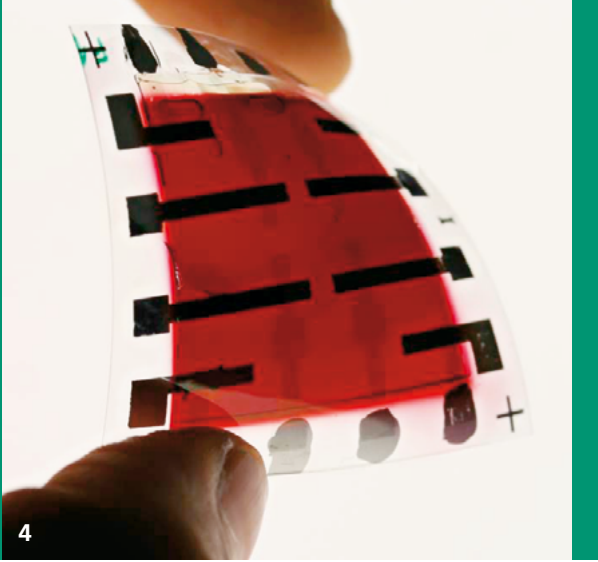
Starting point

It is impossible to think of a world without smartphones and tablets. For screens and photovoltaic cells alike, the functional top layer must be highly transparent and electrically conductive. Carbon nanotubes (CNTs) and graphene are the current promising alternatives for the manufacturing of transparent, conductive sheets. The key properties that make them suitable are their exceptional electrical conductivity aligned to a flexibility and resistance to environmental influences such as UV light. In addition, cost and procurement-related aspects as well as simplified processing show CNTs and graphene possess a unique combination of properties. This combination facilitates the development of innovative applications, for example of transparent, tactile sensors. Pressure sensitivity combined with the touch operation makes innovative applications possible.

IPA's approach to a solution

Fraunhofer IPA offers a unique combination of CNTs and conductive polymers (PEDOT:PSS), to create flexible films and therefore flexible screens. These combinations possess the following properties:

- 85 % transparency at 150 Ohm/sq
- UV-stable: $\Delta R_s < 1 \%$ after 15 hours exposure to UV light
- Durable, flexible, elastic: $\Delta R_s < 1\%$ after 10,000 cycles in the bending test
- Thickness: 50-200 nm
- Substrate: glass, PET
- Increased heat, moisture and UV resistance compared to pure PEDOT:PSS film



Our range of services

We are pleased to offer support in the development of application-specific dispersions and their application processes for flexible and transparent electrodes. The main focus lies on process technology and application development. On account of our experience in this area, we are able to guide you to the desired results.

Characterisation of dispersions and thin films are part of our other services, which we will gladly realize in collaboration with you.

Your benefits

A reduction in price against standard materials is achieved through our unique combination of CNTs and conductive polymers. In addition, the manufacturing is simplified significantly by using wet chemical processes. Flexibility and a resistance against environmental influences are further promising advantages.

The combination of CNTs and conductive polymers facilitates the development of innovative applications, for example transparent, tactile sensors. Pressure sensitivity combined with the touch operation makes innovative applications possible.

We are happy to help by providing solutions for your individual requirements.

- 4 *Organic photo detector on transparent, flexible electrodes.*
- 5 *Reduction of the specific resistance with the addition of single wall carbon nanotubes (SWCNT) to conductive polymers.*