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Development of a Conductive / Adhesive Rubber Ink for Flexible Electrode

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Extended Abstract

Direct ink writing or printing techniques offer an attractive alternative for satisfying the demanding design rules and form factors required for metallic electrodes in printed electronic and optoelectronic devices. Traditionally, the micro-fabrication of conductive patterns by electroplating and etching processes accompanied by lithography is time-consuming and expensive process, because the manufacturing process of a circuit layer is quite complicated. Therefore, there is a clear need for an alternating process like direct ink printing which can simplify the processes leading to a reduction in manufacturing costs. The direct ink printing of metallic nano-particles suspension has attracted increased attention in recent years.

In this study, we demonstrated a simple approach of fabricating the conductive / adhesive rubber ink by mixing a conductive carbon black (ketjen black) and rubber solution. The conductive ink was then direct printing on a glass substrate as a thin film of constant thickness and measured resistance as a function of carbon black content. Also, the adhesive strength of the conducting rubber ink was measured by performing peel test using unfilled rubber sheets as the substrate. The test samples for the peel test were prepared by applying the conductive rubber ink as a thin film between the two unfilled rubber sheets and cured the sheet. The results showed a decrease in the electrical resistance as the carbon black content increases. However, the measurements of the resistance were not possible above 8 phr of filler loading. It was found that the surface cracks were initiated to form at the 6 phr of carbon black loading and they became severe at higher loadings. This seems to be related to the uneven distribution of carbon blacks due to aggregation at higher loading.

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