Final Report Summary

The Encapsulation of Textiles for Solar Cell Applications

Power Textiles Ltd

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Power Textiles Limited is a development company, launched in February 2007. It receives SMART:SCOTLAND funding for the development of solar cells that are fully integrated onto textile fabrics. Novel approaches are used to render a fabric electrically conducting, prior to deposition of thin nanocrystalline silicon films, a process which can be effected at especially low temperatures. A layer of transparent conducting oxide is finally laid down. External contacts have to be added, and the cells have to be encapsulated to render them resistant to atmospheric conditions. Numerous applications are envisaged, including electrical supply in remote areas, for disaster relief, in tents and on roofs, and in specialist military applications.

This project is specifically concerned with identifying encapsulating systems for the textile solar cells, that would improve their resistance to undesirable aging processes and atmospheric attack, whilst retaining a reasonable level of flexibility.

A variety of coating processes and materials were investigated and the encapsulated products were characterised using microscopy and some moisture resistance tests. Equipment was also developed with a view to encapsulating the textile substrates using a modified forming technique. Unfortunately trials of this equipment could not be carried out due to time constraints.

The main findings were that certain polymeric resins provided excellent, transparent, seals around the printed textile samples and offered reasonable levels of flexibility once cured. The encapsulation materials appeared not to affect the textile substrate or the printed silicon and conducting oxide. The encapsulated products also demonstrated improved mechanical abrasion resistance and were largely unaffected by moisture after several days immersion in water at room temperature.

Future work will involve a more detailed appraisal of the polymer resins and curing properties combined with further durability and chemical resistance tests.