PowdermatriX

SPARK CASE STUDY

THE WRITING'S ON THE WALL

What's the Story?
The Tandem Cell is a radically new technology, which has been developed by SME Hydrogen Solar to convert light and water directly into Hydrogen Fuel. The Tandem Cell uses microcrystalline semiconductor films to capture sunlight and generate hydrogen from photocatalytic splitting of water. It has the potential to be a key system in the development of the hydrogen economy.

However, the scaling up of the technology required improved conductivity of the glass substrate.

As the process already uses the highest conductivity, transparent substrate glass that is commercially available an alternative solution was required, and this SPARK project was set up with the purpose of identifying a method where the conductivity of the substrate can be improved prior to the spray pyrolysis process which deposits the active coating.

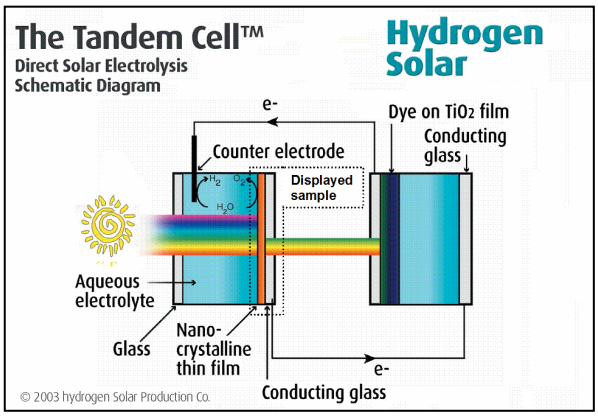
What went on?
Experts at CERAM, the internationally renowned centre for materials and technology based in Stoke on Trent investigated two methods that have the potential to solve the problem; one was the use of various conducting materials and the other involved the attachment of a wire to the glass substrate using a metallic solder/braze paste that wets glass and using a glass powder frit.

The most successful result was achieved using the last of the three conducting material systems investigated. The results achieved (a 0.65-0.75Ωcm^{-1} resistance) were the closest to the target value of 0.50Ωcm^{-1}. The material has a low resistance, is well bonded to the glass substrate, is resistant to the alkali electrolyte and compatible with the iron oxide sprayed coating.

What happened?
Although further work is now necessary to investigate the best way to apply this material, present results show that this method is most suited to the Tandem Cell application. Other methods also showed promise and may provide a lower cost solution than the material after further development.

The conductivity produced offers considerable benefits for production of scaled-up Tandem Cells with equivalent performance to those produced at the smaller laboratory scale, and they also allow the potential for achieving efficiency targets on scaled-up prototypes.

This development would not have been possible without the SPARK Award which has helped to plot a clear path for the future development and exploitation of this very significant technology.



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