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## **Solide Oxide Fuel Cells for Energy Security**

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Investigators from Azerbaijan, Russia, Ukraine, the United Kingdom and the United States are working to develop a new clean energy technology. Their aim is to make an intermediate-temperature (650-800°C) Solid Oxide Fuel Cell (IT SOFC) that would have an enhanced power density and the potential of reducing the cost of decentralized energy generation and supply. The researchers set out to use Scandia-doped Zirconia with high ionic conductivity in all three main components of the IT SOFC – a cathode, an electrolyte and an anode. Since the start of the project in April 2005, a coprecipitation technique has been developed to manufacture 1Ce10ScSZ powder, which demonstrated higher conductivity than comparable materials produced commercially in the United States and Japan. Using an electron beam to deposit dense zirconia electrolyte films on porous NiO-1Ce10ScSZ substrate it was possible to deposit electrolyte layers of different thicknesses without delamination. It has also been possible to develop mixed ionic-electronic conducting doped nickelates and fluorite-perovskite nano-composite systems that show promise for application as cathodes. In the near future SOFCs will be manufactured with different anodes to obtain comparative performance values. It is expected that Zirconia Ukraine, Ltd. will make use of these findings to design and manufacture an SOFC stack to produce electric power of about 50W from natural gas. The company will also evaluate the SOFC as a power source for various portable devices.

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