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Development of Rechargeable Cement Concrete-Based Batteries Using Iron and Nickel as anode and cathode materials.

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In the world's efforts to reduce carbon emissions and introduce zero-carbon buildings, concrete as the most used building material can be used to store a building's power. This research explores how concrete can be used as a rechargeable battery to store power from renewable energy sources such as solar energy and power a building. Some work has been attempted to convert concrete into energy-storing batteries. Previously, researchers tried to make non-rechargeable batteries out of concrete. Later on, the concept developed into making rechargeable concrete batteries to provide for longer-term use. The concept has been using one part as an electrode and another as a cathode with a separator in between thus making a whole battery. The anode components that have been used include either zinc, magnesium or iron while the cathode component include either manganese oxides, copper or nickel. In this research, iron and nickel were used as the anode and cathode material respectively. These two materials were electroplated into carbon fiber mesh and a conductive layer with cement concrete was prepared to surround the electroplated carbon fiber mesh forming a positive and negative charge layer. The separator was made of a cement mortar paste mixed with carbon fibers and ionic exchange resin to increase conductivity. The battery was charged, tested, and found to light a small led lamp. The battery is expected to perform better and light the LED lamp without charging, proving it can store energy and recharge. Also, it is expected to test the mechanical properties of concrete in the batteries before and after charging cycles.