



**High Surface Area, Mesoporous, Poorly Crystalline MnO₂
with High Na⁺ Ion Insertion Capacity**

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ABSTRACT

Poorly crystalline or amorphous MnO₂ is prepared by the redox reaction between aqueous solutions of KMnO₄ and MnSO₄.H₂O at ambient conditions. The as prepared sample obtained by drop-wise addition of KMnO₄ solution to MnSO₄ solution has a specific surface area as high as 184 m² g⁻¹ with narrowly distributed mesopores of 3.5 nm pore diameter. However, there is an increase in crystallinity into the α-form and a decrease in specific surface area with an increase in temperature, when the amorphous MnO₂ samples are heated up to 800 °C. Na/MnO₂ cells are assembled in propylene carbonate electrolyte consisting of NaClO₄. The as prepared sample provides the first discharge capacity of 194 mAh g⁻¹ at a specific current of 50 mA g⁻¹. The attractively high discharge capacity of the as prepared amorphous MnO₂ is attributed to the large specific surface area and mesoporosity. There is a decrease in specific discharge capacity on subjecting the cells to repeated charge-discharge cycling. A discharge capacity of about 70 mAh g⁻¹ is obtained at the end of 30 charge-discharge cycles. The initial discharge capacity values of crystalline α-MnO₂ samples are lower than the amorphous samples, but with improved cycling stability.

Keywords: mesoporous MnO₂; poor crystallinity; Na-ion cells; high capacity.
