**ABSTRACT**

Nanostructured Mg2Ni intermetallic compounds were synthesized by high-energy ball milling. Effect of milling time on structure and surface morphology of milled powders were studied using x-ray diffraction and scanning electron microscopy. Crystallite size and degree of crystallinity were confirmed by using transmission electron microscopy and selected area electron diffraction analysis. The particle size of 20 h milled electrode material is 230 nm and it reduced to 40 nm when the milling time is increased to 30 h. Further increase in the milling time reduces the particles size drastically and starts agglomerating. In order to understand the effect of milling time on reaction rates, differential thermal analysis was performed. Activation energy of the milled powders was calculated using Kissinger analysis. 30 h milled powder exhibits lower activation energy than others. Cyclic voltammetry, electrochemical impedance spectroscopy, and charge–discharge studies were done on the prepared electrode materials. 30 h milled electrode material delivers maximum discharge capacity with a superior capacity retention after 20 cycles at 20 mAg−1.