Nickel oxide crystalline nano flakes: synthesis, characterization and their use as anode in lithium-ion batteries

Nickel oxide crystalline nano flakes (NONFs)—only about 10 nm wide—were produced using a simple and inexpensive chemistry method followed by a short annealing in ambient air. In a first step, Ni(OH)2 sheets were synthesized by adding sodium hydroxide (NaOH) drop-wise in a Ni(NO3)2 aqueous solution that was then sonicated for up to 60 min, washed and vigorously stirred overnight in deionized water. In a second step, the products of this reaction were annealed in ambient air in the temperature range 285–450 °C producing the desired NONFs. The products were characterized using x-ray diffraction, scanning electron microscopy and high resolution transmission electron microscopy including electron diffraction and electron energy-loss spectroscopy. Electrochemical investigations showed that anodes made of these NONFs provided significantly higher discharge capacities (70 to 100% higher) compared to commercial nanometric NiO nanopowder used under the same conditions. Moreover, these NONFs had higher initial capacity retentions at both low and high current densities compared to the same NiO nanopowder.