Enhanced Oxygen Vacancies in Nanostructured $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_{4-\delta}$ with a $\text{P4}_3\text{32}$ Space Group

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$\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_{4-\delta}$ microspheres with a $\text{P4}_3\text{32}$ space group constructed from nanometer-sized primary particles are synthesized using an ammonia-mediated carbonate precipitation method. Rietveld refinement of XRD and XPS results reveal that the total number of oxygen vacancies increases with increasing synthesis time. Li/Ni antisite defects increase with the synthesis time. The 5th discharge capacity of the sample synthesized at 700 °C for 10 h reaches 142.9 mAh g⁻¹ at a discharge rate of 0.1 C. The discharge capacity at a discharge rate of 0.5 C is still above 120 mAh g⁻¹. When the current is increased from 0.2 C to 0.5 C, the percentage of the capacity loss increases sharply with increasing synthesis time. We suggest that this is closely related to the higher number of oxygen vacancies, increasing Li/Ni antisite defects and bigger primary particles.

Keywords: $\text{LiNi}_{0.5}\text{Mn}_{1.5}\text{O}_{4-\delta}$, $\text{P4}_3\text{32}$ space group, nano-structured, oxygen vacancies, Li/Ni antisite defects

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