$CuNb_2O_6$: New Anode Material for Lithium-Ion Batteries

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Among the transition metal oxides, niobium-based oxides have been extensively investigated as intercalation-type anode materials for Li-ion batteries. They offer a safety advantage because of their low surface reactivity with the electrolyte toward forming a solid-electrolyte interphase (SEI) layer. Additionally, in the case of orthorhombic Nb_2O_5, a stable charge-discharge process is permitted by its crystal structure because empty octahedral sites between the (001) planes provide Li-ion transport pathways. However, many bulk niobium-based oxides are primarily disadvantaged by their poor intrinsic electrical conductivity, which results in a low diffusion rate and restricts their use as a replacement for commercialized graphite anode materials. Recently, monoclinic $TiNb_2O_7$, was introduced by the Goodenough group as an alternative anode material. $TiNb_2O_7$ has a higher theoretical capacity (388 mAh g^{-1}) than graphite. Moreover, its safety characteristic, related to the prevention of SEI layer formation due to the higher operating potential, is also attractive. However, the intrinsic low electronic conductivity and poor ionic diffusivity in the $TiNb_2O_7$ lattice still have restricted its electrochemical performance, such as its capacity retention and rate capability [1].
Here, we present a new $CuNb_2O_6$ compound, which is fabricated using a solvothermal process and investigates as an anode material for Li-ion batteries.

References:
[1] S. Yoon, S.-Y. Lee, T. Nguyen, I. Kim, S.-G. Woo, K. Cho, J. Alloys Compd. 731 (2018) 437–443.