

Supporting Information

A Road to Environmentally Friendly Materials Chemistry: Low-Temperature Synthesis of Nanosized $K_{0.5}Na_{0.5}NbO_3$ Powders Through Peroxide Intermediates in Water

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1.) Synthetic Charts of KNN nanopowders prepared from pure aqueous solutions

Fig. 1 Synthesis of KNN powder from Nb(V)-peroxo-citrate aqueous precursor solution

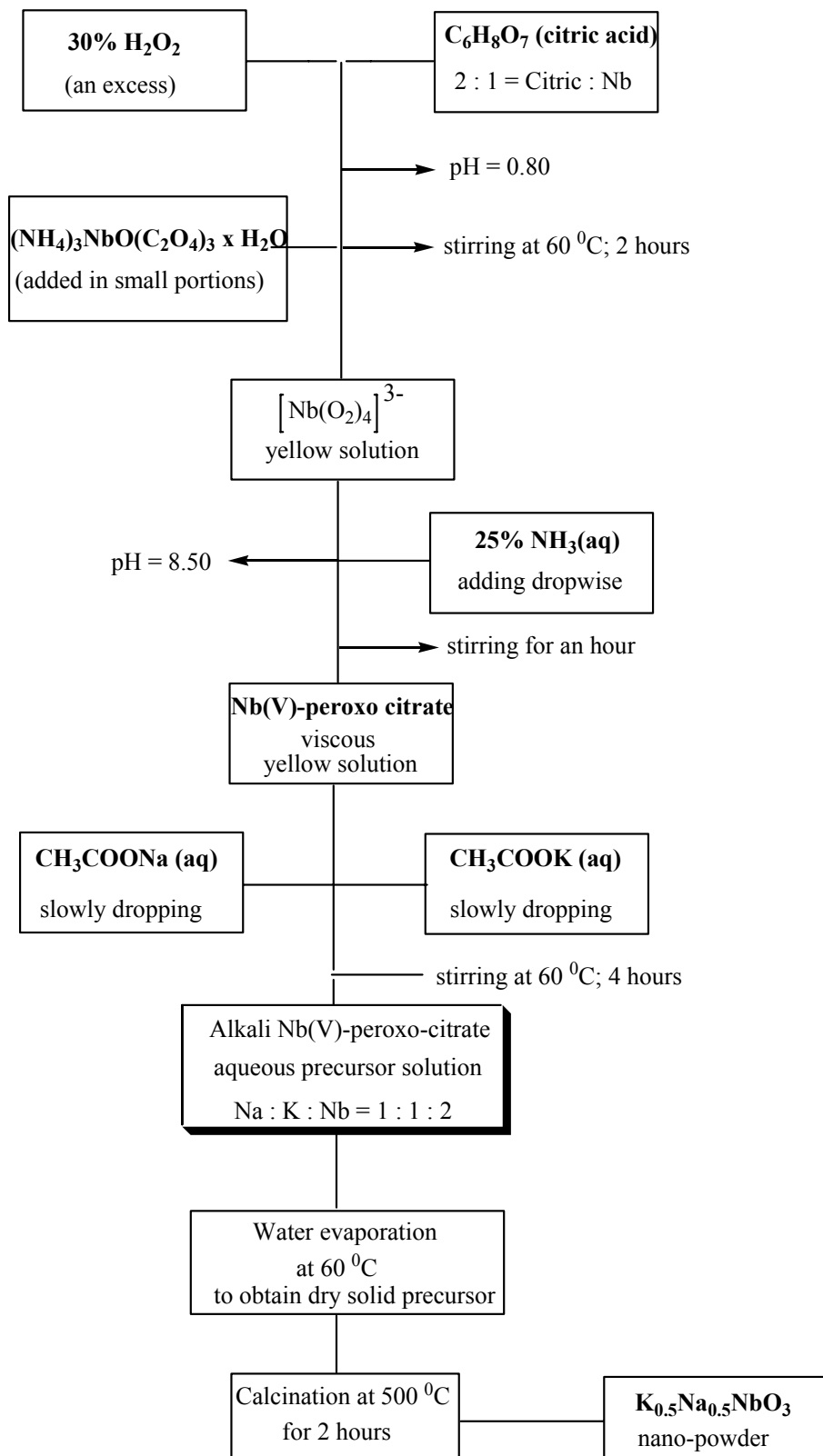
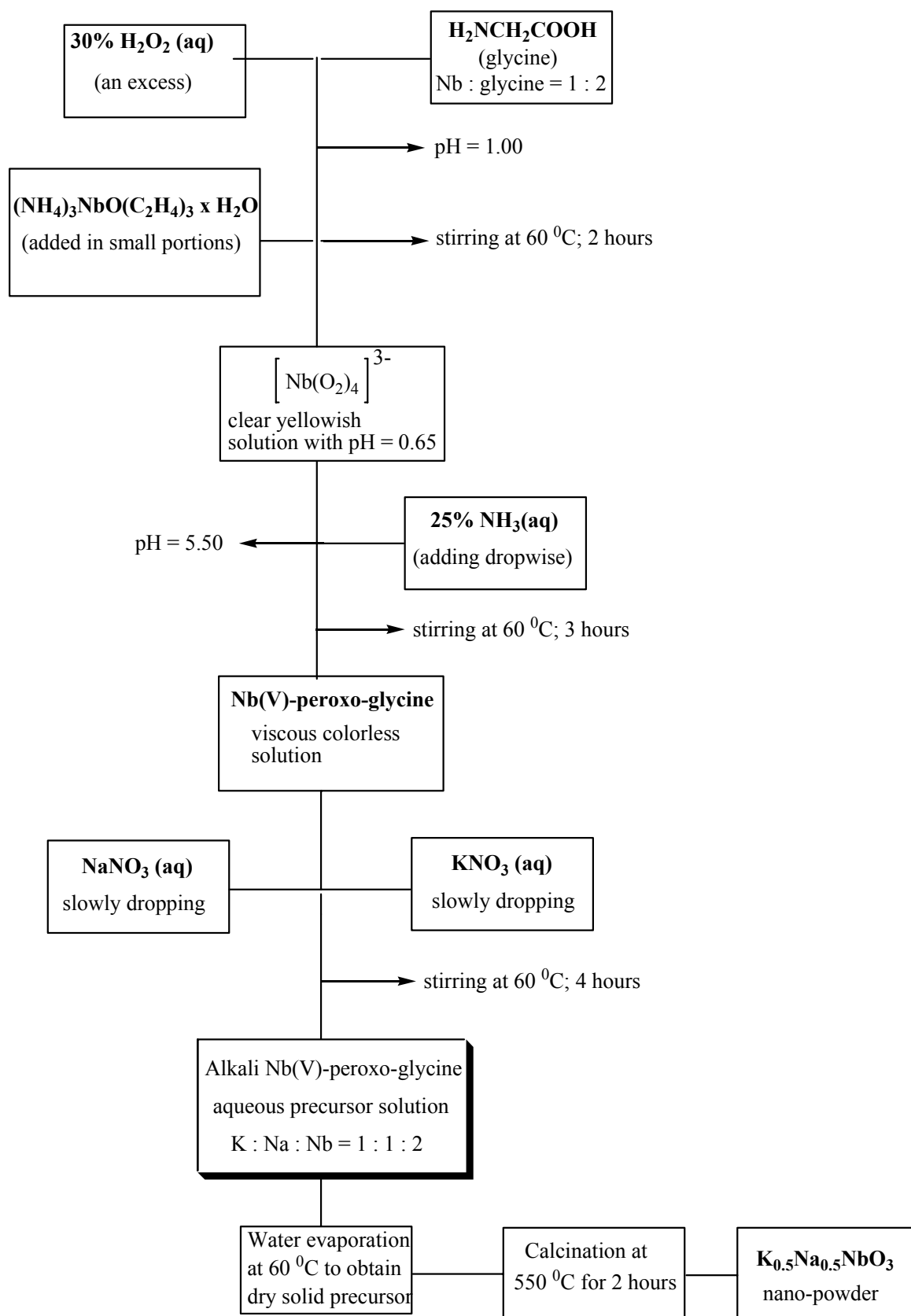


Fig. 2 Synthesis of KNN powder from Nb(V)-peroxo-glycine aqueous precursor solution



2.) IR spectra of Nb(V)-peroxo-based precursors

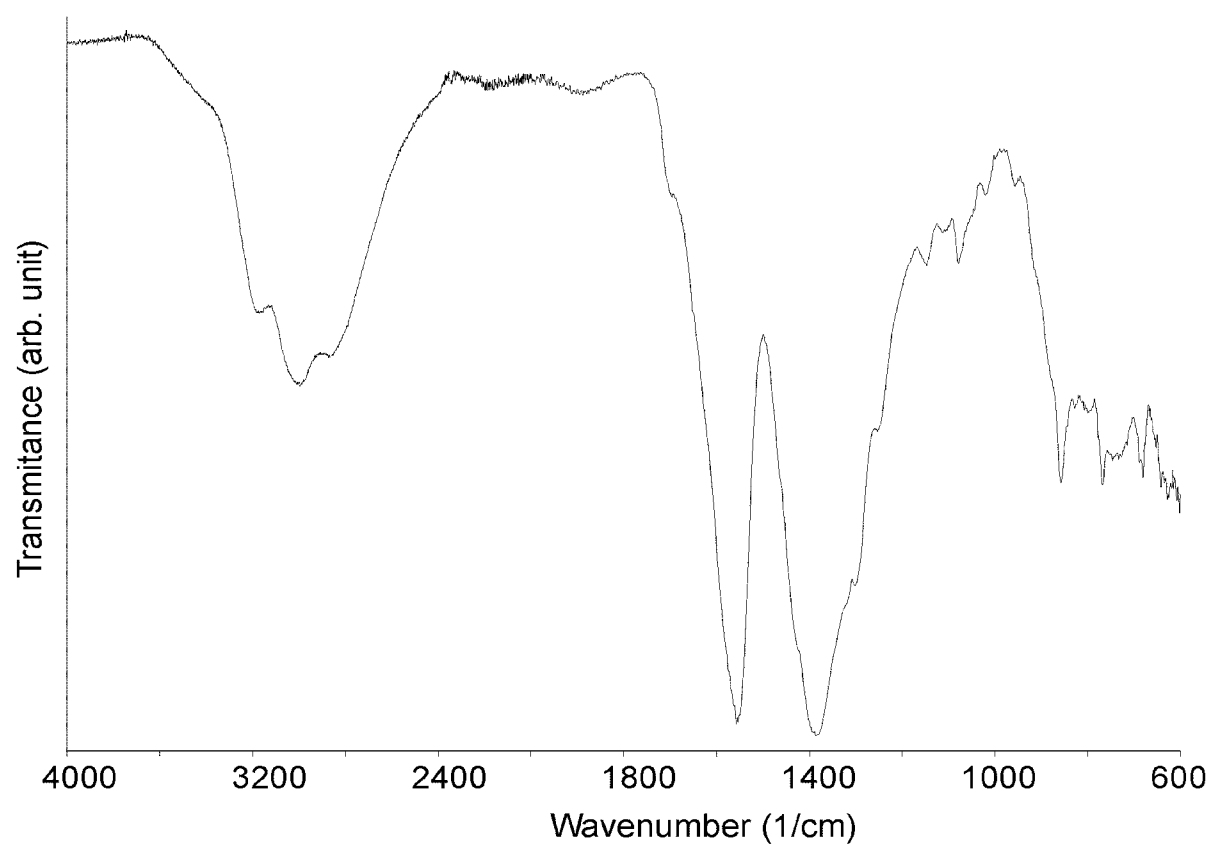


Fig. 3 FT-IR spectrum of Nb(V)-peroxo-citrate precursor prepared from synthetic protocol presented in Fig. 1.

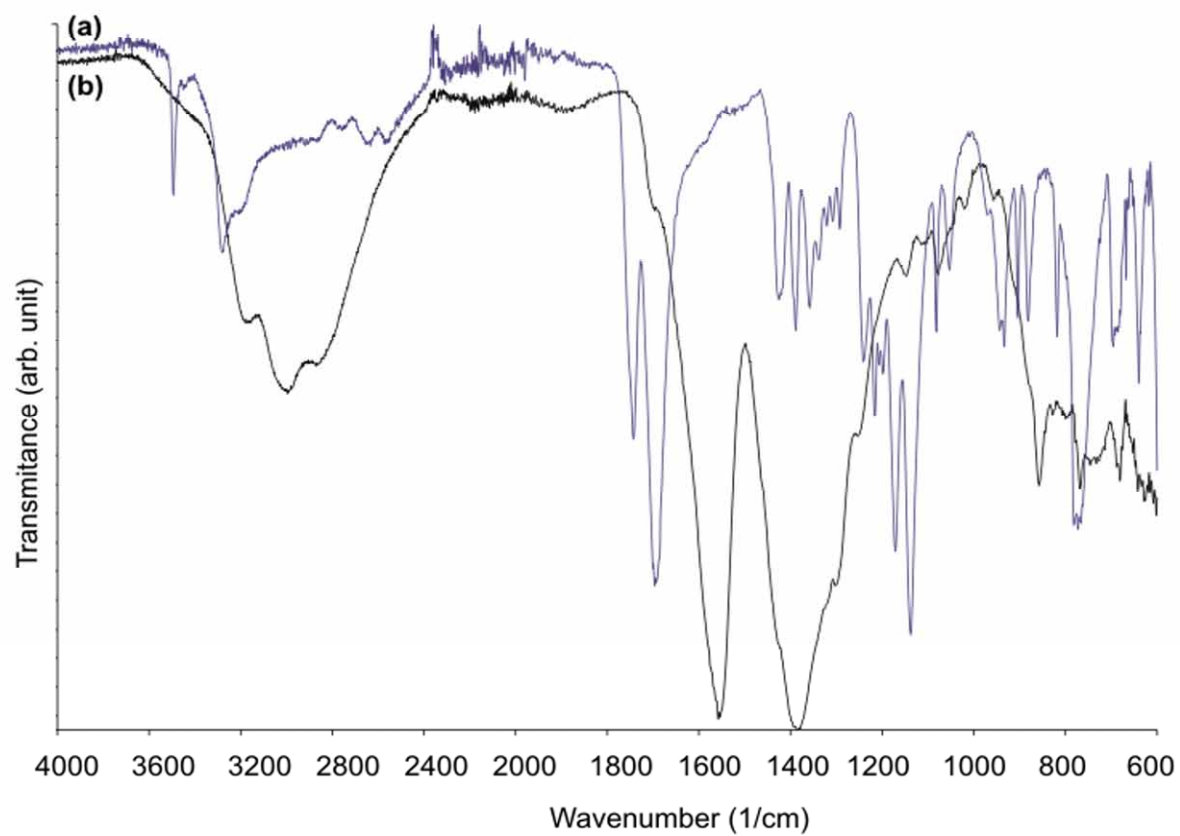


Fig. 4 Comparison of FT-IR spectra of (a) free citric acid (blue profile) with (b) Nb(V)-peroxo-citrate complex (black profile).

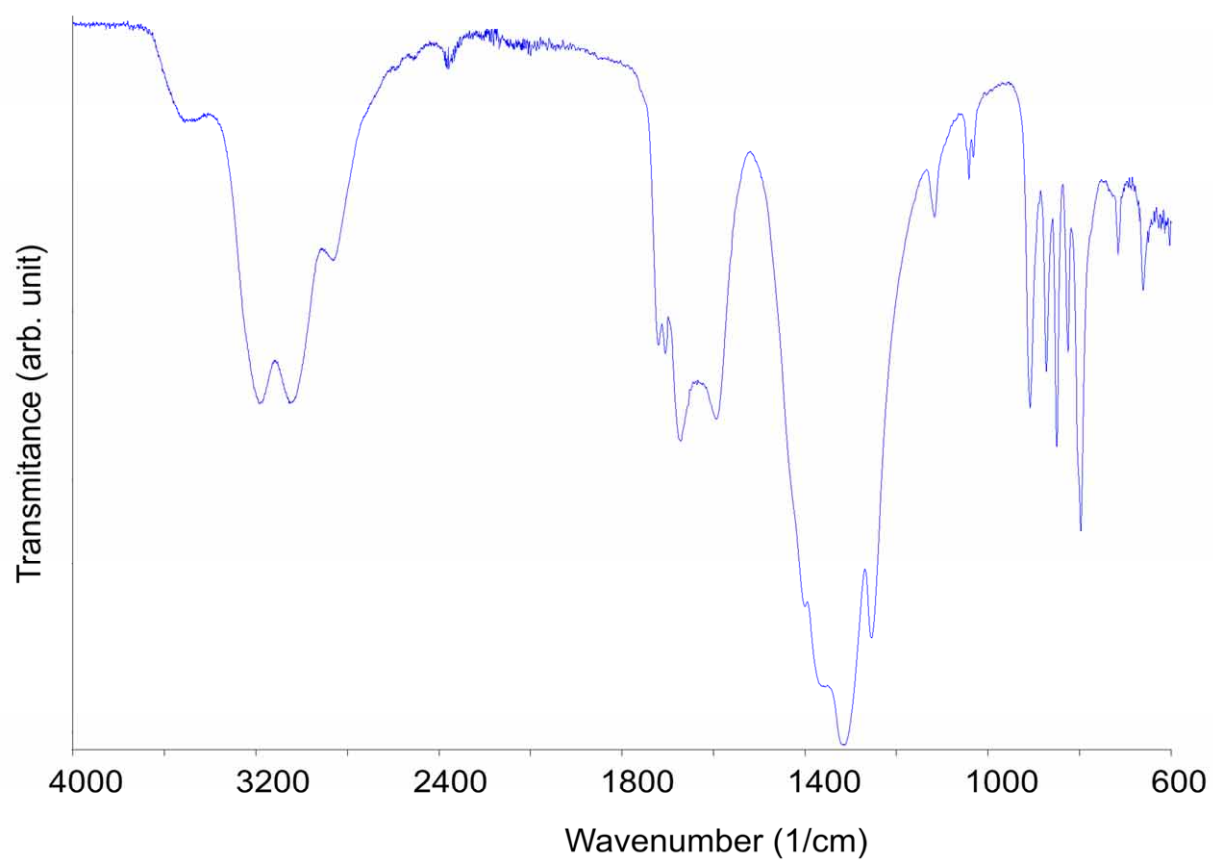


Fig. 5 FT-IR spectrum of Nb(V)-peroxo-glycine precursor prepared from synthetic protocol presented in Fig. 2.

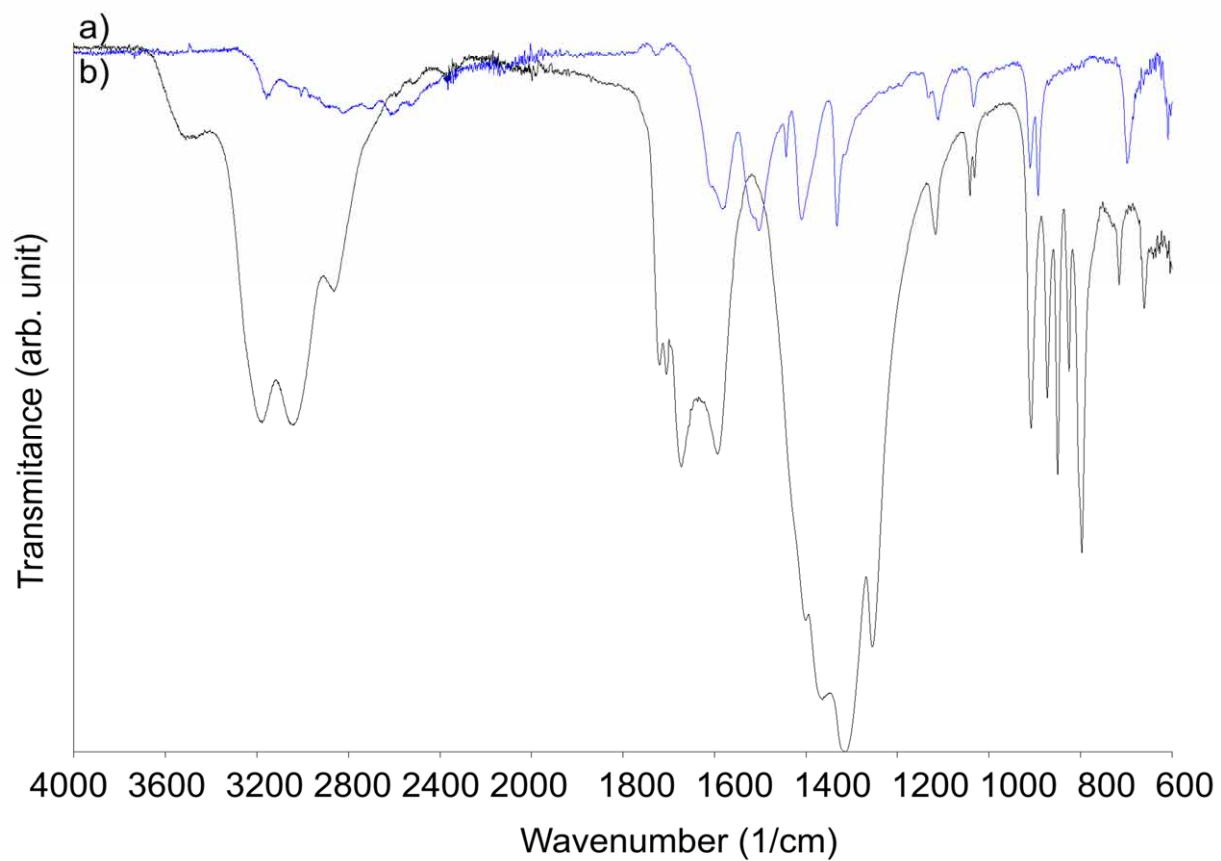


Fig. 6. Comparison of FT-IR spectra of (a) free glycine (blue profile) with (b) Nb(V)-peroxo-glycine complex (black profile).

3.) IR spectrum of annealed final powders

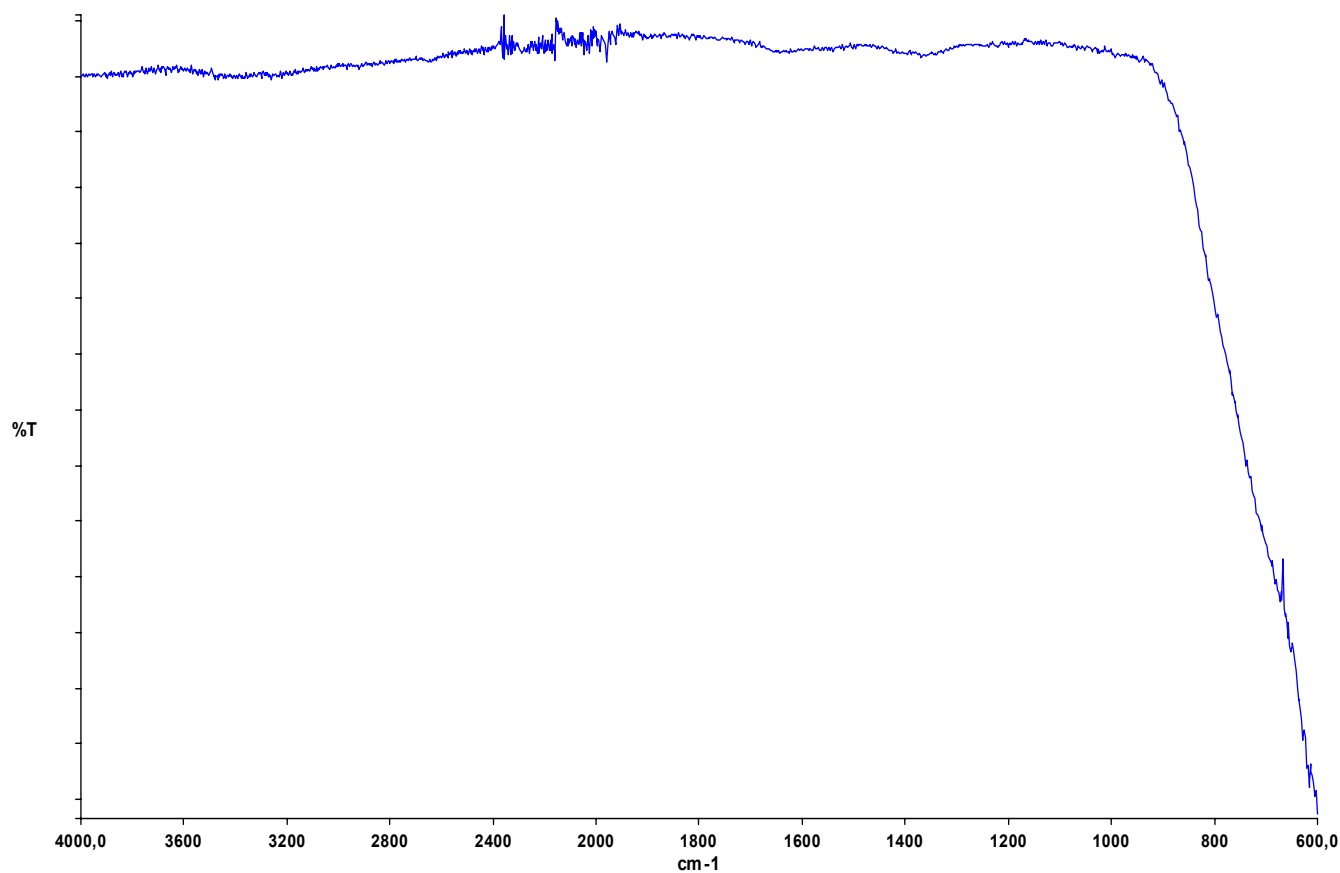


Fig. 7. FT-IR spectrum of $K_{0.5}Na_{0.5}NbO_3$ nanopowders obtained with annealing of Nb(V)-peroxo-citrate or Nb(V)-peroxo-glycine prepared intermediates at $T \geq 500$ °C for 2-4 hours.

Comment:

► FT-IR spectra of annealed powder samples showed no presence of organic residues (residual carbon) or any other impurities which should have absorption in mid-infrared 4000 – 600 cm^{-1} area.

4.) UV-Vis spectra of Nb(V)-peroxo-based precursors

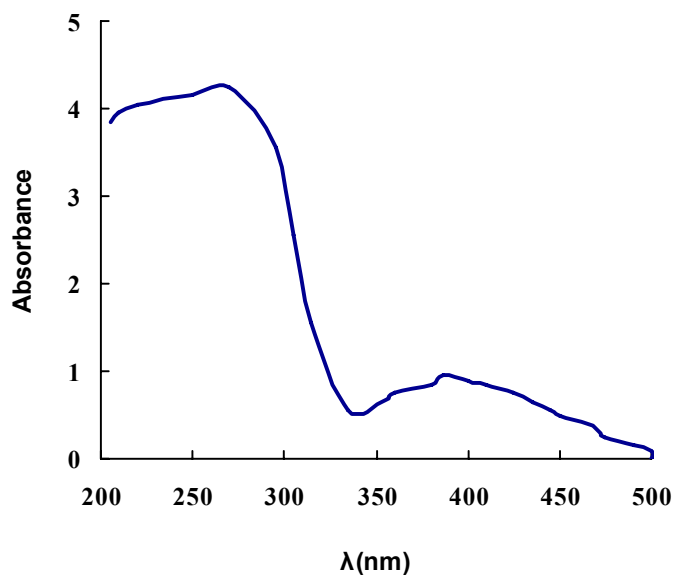


Fig. 8. UV-Vis spectrum of prepared Nb(V)-peroxo-citrato precursor in water^[a]

^[a] strong absorption ($\sigma \rightarrow d\sigma^*$ LMCT) at 270 nm, weak absorption ($\pi^* \rightarrow d\sigma^*$) at 387 nm, below 500 nm no absorption was detected.

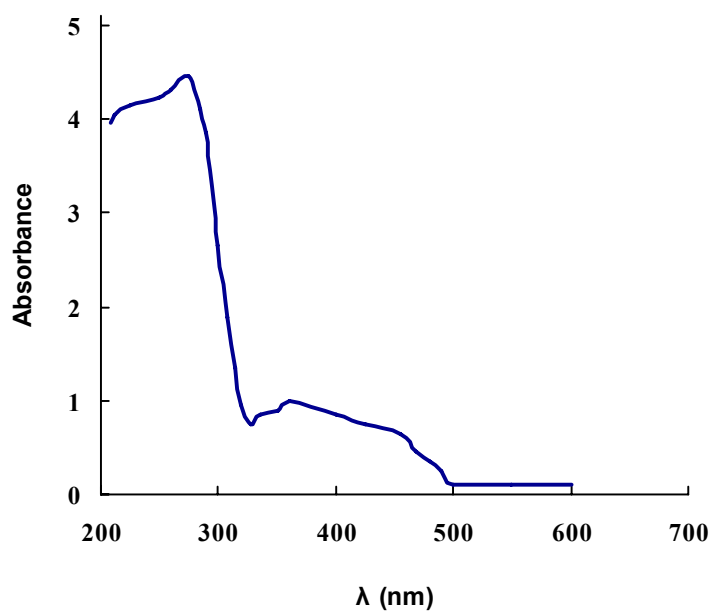


Fig. 9. UV-Vis spectrum of prepared Nb(V)-peroxo-glycine precursor in water^[a]

^[a] strong absorption ($\sigma \rightarrow d\sigma^*$ LMCT) at 275 nm, weak absorption ($\pi^* \rightarrow d\sigma^*$) at 360 nm, below 500 nm no absorption was detected.