



# Mn doping on Mössbauer spectroscopy of maricite-NaFePO<sub>4</sub> as cathode material

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## Abstract

Transition metal ion substitution in sodium phosphate is effective in enhancing the performance of a cathode material. The maricite-NaFe<sub>1-x</sub>Mn<sub>x</sub>PO<sub>4</sub> ( $x=0.1, 0.2, 0.3, 0.4,$  and  $0.5$ ) were synthesized using solid-state procedures. The lattice constants and bond lengths between Fe–O ions of NaFe<sub>1-x</sub>Mn<sub>x</sub>PO<sub>4</sub> increased by increasing the Mn substitutions. The temperature dependence of the magnetization for NaFe<sub>1-x</sub>Mn<sub>x</sub>PO<sub>4</sub> decreased with an increase in the Mn substitutions, indicating a weakened antiferromagnetic interaction. The Mössbauer spectra exhibited asymmetrical line below the Néel temperature ( $T_N$ ) and were fitted with eight Lorentzian lines, owing to a strong crystalline field in the distorted Fe(Mn)O<sub>6</sub> octahedral site.

**Keywords** Maricite-NaFePO<sub>4</sub> · Manganese-substitute · Magnetic properties · Mössbauer spectroscopy