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Mössbauer spectroscopy investigation of lithium oxide-hematite solid solution VASILII BUSHUNOW, MONICA SORESCU, Duquesne University — Lithium oxide-doped hematite $x\mathrm{Li_2O}$ $_*$ (1-x) α-$\mathrm{Fe_2O_3}$(x = 0.1-0.7) solid solutions were prepared via ball milling. Samples were taken at 0, 2, 4, 8, and 12 hours ball milling time (BMT). Parameters for the obtained Mössbauer spectra were determined by least-squares fitting using NORMOS-90 software. For all initial $\mathrm{Li_2O}$ concentrations, partial substitution of $\mathrm{Fe^{3+}}$ in the $\mathrm{Li_2O}$ lattice and vice versa was seen beginning at two hours BMT. For x = 0.1, 0.3, and 0.5, spectra were fit with one or two sextets and one quadrupole-split doublet. For x = 0.7, all spectra were fit with a single sextet and one quadrupole-split doublet. With increased BMT, the abundance of the doublet increased, irrespective of initial $\mathrm{Li_2O}$ concentration. For example, the abundance of the doublet increased from 2.3% at 2 h BMT to 11.1% at 12 h BMT for x = 0.1. The increasing abundance of the doublet indicates greater substitution of $\mathrm{Li^+}$ by $\mathrm{Fe^{3+}}$ in the $\mathrm{Li_2O}$ lattice. Increasing the initial concentration of $\mathrm{Li_2O}$ for constant BMT did not consistently increase the abundance of the doublet. The results of this experiment demonstrate the feasibility of forming solid solutions by purely mechanical methods, e.g. ball milling.

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