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Neutron Scattering Study of Electron-Phonon Coupling in $\text{La}_{1/3}\text{Sr}_{2/3}\text{FeO}_{3-\sigma}$ Perovskite J. MA, J.-Q. YAN, S. CHANG, R. J. MCQUEENEY, Ames Lab., Dept. of Phys. and Astro., Iowa State U., Ames, IA 50011, F. TROUW, M. HEHLEN, Los Alamos National Laboratory, Los Alamos, NM 87545 — $\text{La}_{1/3}\text{Sr}_{2/3}\text{FeO}_{3-\delta}$ compounds are reported to have an unusual magnetostructural transition at low temperatures. Below $\sim 210\text{K}$, it is proposed that charge disproportionation occurs according to $2\text{Fe}^{4+} \Rightarrow \text{Fe}^{3+} + \text{Fe}^{5+}$, thereby creating different valence on the iron sites. The different iron valences order along the body diagonal $[111]_c$, resulting in a change in crystal structure from rhombohedral to orthorhombic and antiferromagnetic ordering. Inelastic neutron scattering was used to determine the effect of simultaneous charge and magnetic ordering on the phonon and spin wave excitations. We find that the high frequency oxygen phonons (~ 80 meV) soften above the transition by several meV. Spin wave excitations appear below the transition with a characteristic energy of 50 meV at the Brillouin zone boundary. The result and relationship between the charge ordering and the electron-phonon interaction are discussed.

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