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A theory for the multiferroic compound $LiCu_2O_2$ TRINANJAN DATTA, Department of Chemistry and Physics, Augusta State University, CHEN FANG, JIANGPING HU, Department of Physics, Purdue University — We investigate the possible coupling between ferroelectricity and magnetic structure in the zig-zag spin chain compound $LiCu_2O_2$. Based on a group theory analysis, we construct a multi-order parameter phenomenological model and show that a coupling involving the inter-chain magnetic structures and ferroelectricity is necessary in order to understand the experimental results of Park *et. al.* The model is able to account for the electric polarization flip through $\pi/2$ and explain the occurrence of an electric polarization parallel to an applied external magnetic field.

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