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Theory of lattice response to external magnetic field in $SrCu_2(BO_3)_2$: magnetostriction driven by panthograph effect ANDRES SAUL, CINaM/CNRS, CEE/MIT and UMI/CNRS-MIT, GUILLAUME RADTKE, IMPMC/CNRS and Univ Paris 06, MARCELO JAIME, National High Magnetic Field Laboratory, Los Alamos National Laboratory, MYRON SALAMON, Department of Physics, The University of Texas at Dallas, HANNA DABKOWSKA, McMaster Univ. — Recent magnetostriction experiments have shown that the macroscopic physical dimensions of the Shastry-Sutherland compound $SrCu_2(BO_3)_2$ change with the applied magnetic field mimicking the same complex behavior observed in the magnetization. Using Density Functional based methods we find that the driving force behind the magnetoelastic coupling is the Cu-O-Cu superexchange angle which, thanks to the orthogonal Cu^{2+} dimers acting as pantographs, can shrink significantly (0.44%) with minute (0.01%) variations in the lattice parameters. The consequence is a reduction of the order of $\sim$10% in the antiferromagnetic intra-dimer exchange integral J, sufficient to compensate the elastic energy loss in the deformation.

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