Enhanced magneto-elastic coupling in hexagonal multiferroic HoMnO$_3$ MARIO POIRIER, JULIEN CAMIRAND LEMYRE, PIERRE-OLIVIER LAHAIE, Universite de Sherbrooke, LOREYNNE PINSARD-GAUDART, ALEXANDRE REVCOLEVSCHI, Universite Paris-Sud —

From ultrasonic velocity measurements, we report a study of the magneto-elastic coupling occurring on elastic moduli $C_{11}$ and $C_{33}$ at the different magnetically induced phase transitions in HoMnO$_3$. Although both the Ho-Mn and Ho-Ho interactions soften the elastic moduli, the largest softening is observed on $C_{11}$ over a wide temperature range extending well beyond the Néel temperature. An in-plane orientation of the magnetic field reduces strongly the softening due to a stabilization of the Mn moments order; concurrently, the Ho magnetic order is destroyed. When the field is rather oriented along the $c$ axis, the elastic softening is enhanced as if the Ho-Mn interactions were reinforced and the Mn order consequently destabilized. The phase diagram deduced from the elastic anomalies observed at the several phase transitions are in agreement with microwave measurements performed on the same sample. An in-plane anisotropy of the diagram is also proposed.

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Date submitted: 16 Nov 2010

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