Elastic Anomalies Associated with Structural and Superconducting transitions in Iron-based Superconductor $Ba(Fe_{1-x}Co_x)_2As_2$

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Discovery of superconductivity in F-doped LaFeAsO compound causes an outpouring of experimental and theoretical studies of the materials containing Fe-As layers as a structural unit. $BaFe_2As_2$ shows a structural/magnetic phase transition at $T_S = 145$ K. By replacing Fe ion by Co, the structural/magnetic order is suppressed, and a superconducting phase comes out. By further Co doping, the phase transition is disappeared. We have measured the elastic constants $(C_{11} - C_{12})/2$, C_{44}, C_{66} of this system. We have observed large elastic softening toward the structural transition in C_{66} for under-doped samples. The anomaly in C_{66} tends to disappear with increasing Co concentration for over-doped region. The amount of the anomaly correlates with the superconducting transition temperature T_{sc}. On the other hand, $(C_{11} - C_{12})/2$ and C_{44} show no remarkable anomaly at T_S, but shows a small anomalies at T_{sc}. C_{66} shows a large elastic anomaly associated with the superconducting transition for the optimum doped sample. These experimental facts will give relevant information on the coupling between the superconducting order parameter and the elastic strain, which will be given in the presentation.