Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Pressure-Induced Structural, Magnetic and Transport Transitions in the Two-Legged Ladder $Sr_3Fe_2O_5$ TAKAFUMI YAMAMOTO, CEDRIC TASSEL, YOJI KOBAYASHI, Kyoto University, TAKATERU KAWAKAMI, Nihon University, TAKU OKADA, TAKEHIKO YAGI, University of Tokyo, HIDETO YOSHIDA, TAKANORI KAMATANI, YOSHITAKA WATANABE, Nihon University, TAKUMI KIKEGAWA, High Energy Acceleration Research Organization (KEK), MIKIO TAKANO, KAZUYOSHI YOSHIMURA, HIROSHI KAGEYAMA, Kyoto University — The layered compound $SrFeO_2$ with an FeO_4 square-planar motif exhibits an unprecedented pressure-induced spin state transition ($S = 2$ to 1), together with an insulator-to-metal (I-M) and an antiferromagnetic-to-ferromagnetic (AFM-FM) transition. In this study, we have studied the pressure effect on the structural, magnetic and transport properties of the structurally related two-legged spin ladder $Sr_3Fe_2O_5$. When pressure was applied, this material first exhibited a structural transition from *Immm* to *Ammm* at $P_s = 30 \pm 2$ GPa. This transition involves a phase shift of the ladder blocks from (1/2,1/2,1/2) to (0,1/2,1/2), by which a rock-salt type SrO block with a seven-fold coordination around Sr changes into a CsCl-type block with eight-fold coordination, allowing a significant reduction of volume. However, the $S = 2$ antiferromagnetic state stays the same. Next, a spin state transition from $S = 2$ to $S = 1$, along with an AFM-FM transition was observed at $P_c = 34 \pm 2$ GPa, similar to that of $SrFeO_2$. A sign of an I-M transition was also observed at pressure around P_c.

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Date submitted: 08 Nov 2011 Electronic form version 1.4