Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

First-order metal-insulator transition and structural phase transition: analysis of coherent phonons observed by femtosecond pulse laser in VO_2 HYUN-TAK KIM, BYUNG-GYU CHAE, BONG-JUN KIM, YONG WOOK LEE, SUN JIN YUN, KWANG-YONG KANG, ETRI in Korea, KANG-JEON HAN, KI-JU LEE, Chungnam U., YONG-SIK LIM, Konkuk U. — It has been well-known that VO_2 undergoes both a structural phase transition (SPT) (electron-phonon interaction) from monoclinic (insulator phase) to tetragonal (metal phase) and of a discontinuous first-order metal-insulator transition (MIT) (Jump) (electron-electron interaction) near 68^oC. Peierls transiton and Mott transition in VO_2 remain controversial. We have investigated a relation of the MIT and the SPT in VO_2 by observing coherent phonons using a laser with a femtosecond pulse width (10$\sim$20 ft). A coherent phonon indicating a metal phase is measured after MIT. This indicates that the SPT does not affect the MIT. This is confirmed by a micro-Raman scattering experiment and XRD. The speed of the first-order MIT is interpreted as about 100 femtosecond. This is different from a well-known analysis in which the SPT and the MIT simultaneously occur. (References on the MIT: New J. Phys. 6 (1994) 52 (http://www.njp.org), Appl. Phys. Lett. 86 (2005) 242101, Physica B 369 (2005) 76; cond-mat/0607577; cond-mat/0608085; cond-mat/0609033)

Hyun-Tak Kim
ETRI in Korea

Date submitted: 02 Nov 2006 Electronic form version 1.4