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Mott metal-insulator transition-induced electrical oscillation in VO_2 HYUN-TAK KIM, ETRI, YONG WOOK LEE, Pukyong University; ETRI, BONG-JUN KIM, SUN JIN YUN, ETRI, SUNGYOUL CHOI, BYUNG-GYU CHAE, ETRI — Since Mott predicted the abrupt first-order metal-insulator transition (MIT) in 1949, one of the most important issues in contemporary solid-state physics has been to experimentally prove Mott's MIT in a strongly correlated system with electron-electron interaction. The MIT has many practical applications and is believed to facilitate the understanding of physical phenomena, such as high-T_c superconductivity, colossal magnetoresistance, etc. In particular, in order to reveal the mechanism of the Mott MIT, many physicists have paid attention to a representative paramagnetic insulator, $VO_2(4d^1)$, with an abrupt resistance change near 68°C. The key issue is whether VO_2 is a Mott insulator, in which the abrupt MIT is not caused by a structural phase transition (SPT), or a Peierls insulator undergoing the SPT near $T_{SPT} \approx 68$°C; this question can be answered when a monoclinic and correlated metal (MCM) phase different from a normal metal is observed. Here we show an MCM phase, high frequency electrical oscillations in the MCM phase of VO_2. The oscillation possibly is generated from a temporal capacitor, which is comprised of both temporary dielectric components, arising from inhomogeneity in a VO_2 film, and MCM phases acting like electrodes. This work concluded that the electrical oscillation is a characteristic of the Mott MIT. (Ref: Applied Physics Letters 92 (2008) 162903).

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