Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

A divalent rare earth oxide semiconductor: Yttrium monoxide[1]
KENICHI KAMINAGA, RYOSUKE SEI, Univ of Tokyo, KOUICHI HAYASHI, Nagoya Institute of Tech., NAOHISA HAPPO, Hiroshima City Univ., HIROO TAJIRI, JASRI, DAICHI OKA, TOMOTERU FUKUMURA, Tohoku Univ., TETSUYA HASEGAWA, Univ of Tokyo — Rare earth sesquioxides like Y_2O_3 are known as widegap insulators with the highly stable closed shell trivalent rare earth ions. On the other hand, rare earth monoxides such as YO have been recognized as gaseous phase, and only EuO and YbO were thermodynamically stable solid-phase rock salt monoxides. In this study, solid-phase rock salt yttrium monoxide, YO, was synthesized in a form of epitaxial thin film by pulsed laser deposition method [1]. YO possesses unusual valence of Y^{2+} ([Kr] $4d^1$). In contrast with Y_2O_3, YO was narrow gap semiconductor with dark-brown color. The electrical conductivity was tunable from 10^{-1} to $10^3\,\Omega^{-1}\mathrm{cm}^{-1}$ by introducing oxygen vacancies as electron donor. Weak antilocalization behavior was observed indicating significant spin-orbit coupling owing to $4d$ electron carrier. The absorption spectral shape implies the Mott-Hubbard insulator character of YO. Rare earth monoixdes will be new platform of functional oxides. [1] K. Kaminaga et.al., Appl. Phys. Lett. **108**, 122102 (2016). (Selected as Editor's Picks)

[1]This work was supported by JST-CREST, the Japan Society for the Promotion of Science (JSPS) with Grant-in-Aid for Scientific Research on Innovative Areas (Nos. 26105002 and 26105006), and Nanotechnology Platform (Project No.12024046) of MEXT, Japan.

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Date submitted: 30 Oct 2016 Electronic form version 1.4