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Correlation enhanced effective mass of two-dimensional electrons in $Mg_xZn_{1-x}O/ZnO$ heterostructures YUICHI KASAHARA, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, University of Tokyo, YUGO OSHIMA, RIKEN, JOSEPH FALSON, YUSUKE KOZUKA, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, University of Tokyo, ATSUSHI TSUKAZAKI, Department of Materials Science, University of Tokyo, MASASHI KAWASAKI, YOSHIHIRO IWASA, Quantum-Phase Electronics Center (QPEC) and Department of Applied Physics, University of Tokyo — $Mg_xZn_{1-x}O/ZnO$ provides extremely clean two-dimensional electron systems (2DESs) that exhibit the integer and fractional quantum Hall effects, as in GaAs-based heterostructures. The uniqueness of $Mg_xZn_{1-x}O/ZnO$, compared with the GaAs-based heterostructures, lies in the fact that such clean 2DESs emerge with effective mass of electrons in ZnO, which is over four times higher than that in GaAs, indicating that the effects of electron correlation are expected to be much more pronounced than their GaAs counterparts. Here we show the results of combined magnetotransport and cyclotron resonance experiments on 2DESs confined in $Mg_xZn_{1-x}O/ZnO$ heterostructures. We have observed a steep enhancement of transport masses (m^*_{tr}) with decreasing carrier density, whereas the effective masses determined by the cyclotron resonance (m^*_{CR}) are independent of the carrier density and are comparable to the effective mass of bulk ZnO. The discrepancies between m^*_{tr} and m^*_{CR} directly gauges the strength of the electron-electron interactions. Therefore, observed enhancement of m^*_{tr}, which exceeds m^*_{CR} by nearly 60%, is a direct consequence the electron-electron interactions. [1] Y. Kasahara et al., Phys. Rev. Lett., Accepted.

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