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Chemical Reactions in Single Precursor MOCVD Process of Nonstoichiometric AlO_x Films and Their Resistance Switching Phenomena

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ReRAM (resistance random access memory) using non-volatile resistance switching phenomenon is one of the promising candidates for next generation NVM (non-volatile memory) device. The resistance switching has been usually observed at binary oxides and the origin has been explained by defect-related phenomenon. In this study, nonstoichiometric AlO_x films were deposited on $Ir/SiO_2/Si$ substrates by single precursor MOCVD using a DMAI {dimethylaluminum isopropoxide, $(CH_3)_2AlOCH(CH_3)_2$} without any other reactant gas. If the chemical and thermal decomposition process of the single precursor is suitable to deposite thin film by MOCVD, the decomposition mechanism can easily give to nonstoichiometric compositional uniformity. One aluminum and one oxygen atom are contained in DMAI molecule, which indicates the possibility of nonstoichiometric aluminum oxide film (Al : O = 1 : 1) as shown in the depth profiling AES measurement. By using *in-situ* mass spectroscopy measurements of byproducts in the thermal reaction of DMAI precursor, the β-hydrogen elimination mechanism of DMAI molecule was proposed in the MOCVD process. The current-voltage measurement of $Au/AlO_x/Ir$ MIM structure shows high on/off ratio larger than 10^6, which shows possible application of the AlO_x thin film prepared by single precursor CVD process for ReRAM device.