Novel Multi-bit SONOS Type Flash Memory Using a High-k Charge Trapping Layer

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Abstract

We demonstrated SONOS flash memory with a SiO_2/High-k/SiO_2 structure based on a 2-bit/cell scheme. We evaluated three kinds of high-k dielectric films which were Si_3N_4, Al_2O_3 and HfO_2. Among these films, Al_2O_3 showed superior retention characteristics. The charge loss amount of Al_2O_3 at 150℃ is almost the same as that of Si_3N_4 at 25℃. HfO_2 showed poor retention characteristics. In addition, we have found that each film has a different charge loss mechanism. We speculate that Si_3N_4 causes vertical charge migration, Al_2O_3 causes scarcely any leakage, and HfO_2 causes lateral charge migration. As a consequence, Al_2O_3 is very suitable for a charge trapping layer in multi-bit SONOS memory.