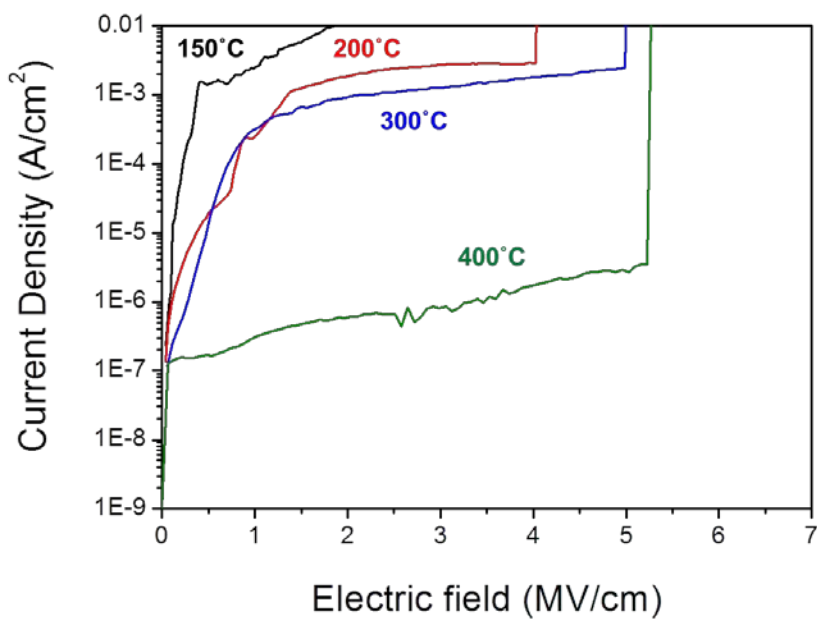


**Fig. S4** Thickness of  $\text{HfO}_2$  thin films coated from aqueous solution and from 2-methoxyethanol solution as a function of annealing temperature. Significant shrinkage of  $\text{HfO}_2$  thin film coated from 2-methoxyethanol solution indicates  $\text{HfCl}_4$  sublimation and large amount of residual precursor intermediates.



**Fig. S5** Representative current–voltage characteristics for  $\text{HfO}_2$  films that is coated from 2-methoxyethanol solution and annealed in air for 1 h with various annealing temperatures.