Low-Temperature High-Pressure Deuterium Annealing for Defect Passivation in ALD-Deposited HfO_2 High-k Films

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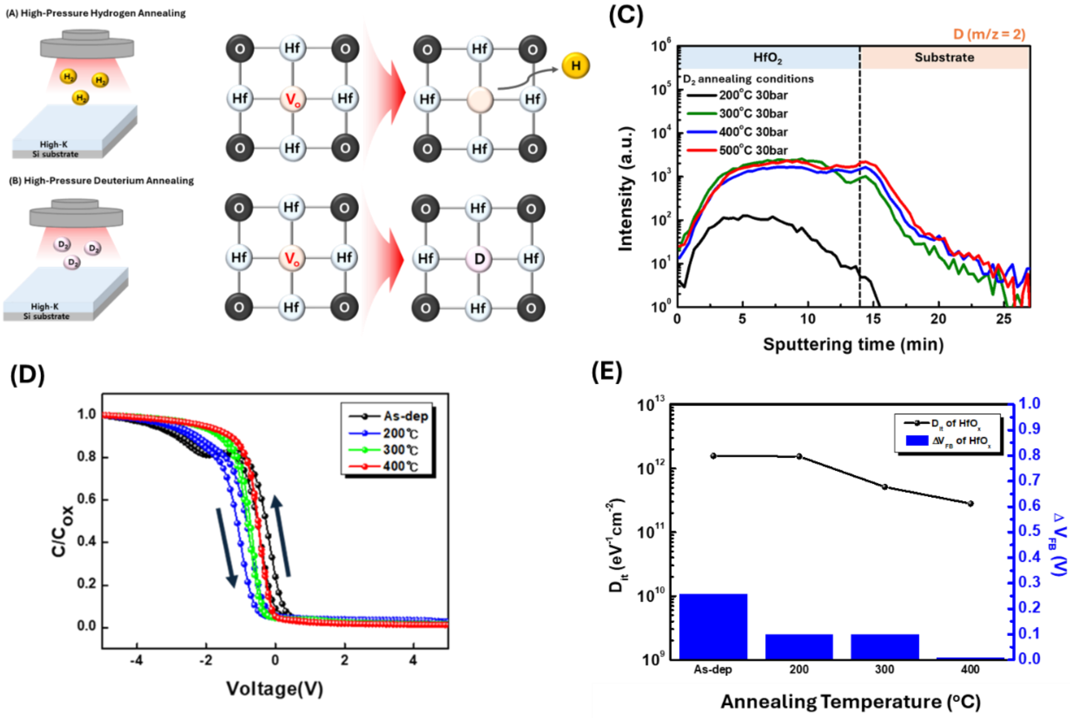

Figure 1. (A) Schematic illustration of high-pressure hydrogen annealing applied to an ALD-grown HfO_2 thin film. (B) Schematic illustration of high-pressure deuterium annealing applied to an ALD-grown HfO_2 thin film.(C) D-SIMS depth profiles of ALD-deposited HfO_2/Si after high-pressure deuterium annealing (30 bar) at different temperatures. (D) C–V characteristics of ALD-grown HfO_2/Si capacitors before and after deuterium treatment at various temperatures. (E) Interface trap density (D_{it}) and flat-band voltage shift (ΔV_{FB}) as a function of deuterium annealing temperature.