ABSTRACT

METHOD OF REDUCE GATE OXIDE DAMAGE BY USING A MULTI-STEP ETCH PROCESS WITH A PREDICTABLE PREMATURE ENDPOINT SYSTEM

A method of fabricating a gate stack having an endpoint detect layer and a multi-step etch process to prevent damage to a gate dielectric layer. The special endpoint detect layer emits an endpoint signal that allows the etch chemistry to be changed to a more selective Poly to oxide ratio to prevent damage to the gate oxide layer. The invention begins by forming gate dielectric layer over a substrate. We then form an endpoint detect layer over the gate dielectric layer. A gate stack is formed over the bottom silicon layer. Then a mask is formed over the gate stack. The mask defines a gate electrode. We etch the gate stack and the endpoint detect layer using multi-step etch comprising at least 3 steps. In a main etch step, using a first etch chemistry, etching the gate stack and the endpoint detect layer stopping the first etch step when a endpoint detection signal is detected from etching the endpoint detect layer. In an endpoint detect layer etch step; using a second etch chemistry, we etch the gate stack layer and the endpoint detect layer and stopping the endpoint etch step when and endpoint detect signal changes upon reaching the gate dielectric layer. The second etch chemistry has a higher selectivity from the gate dielectric layer to the gate stack layer and endpoint detect layer than the first etch chemistry. In an overetch step; using a third etch chemistry with a higher selectivity than the second etch chemistry, we etch the endpoint detect layer without damaging the gate dielectric layer.

(FIGURE 1 IS SUGGESTED FOR PUBLICATION)