

A SYSTEMATIC DRY ETCHING PROCESS FOR PROFILE CONTROL OF QUANTUM DOTS AND NANOCONSTRICTIONS

Abstract

In essence, quantum dot dimensions and others can be laterally and vertically defined by using either bottom up or top down methods respectively. In fabrication that uses top down method, etch process hold a chief role. Varieties of etch times and oxygen flow rates in ranges 75–88 s and 20–50 sccm, respectively, were devised to fabricate optimum dimension of nanostructure. As a result, as etch time increased, lateral etch rate of silicon quantum dot, source and drain and also the nanostructure etch depth increased. However, high roughness of etched silicon surface profile led to concave surfaces of source and drain. In this research, no significant relation between quantum dot diameters and oxygen flow rates was found. There was a reflection point, fixed data dot of 26 sccm, of the decreasing and increasing lines of relation between nanostructure depth of etched silicon and nanostructure gradient with the O₂ flow rate.

Keywords: Nanostructure dimension; Dry etch process