The Effects of Plasma Treatments on the Field Emission Characteristics of Silicon Nanowires

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ABSTRACT

Silicon nanowires have been synthesized on Si substrate (100) via a Ni catalytic reaction in Ar ambience at 1000 ° C for 2hr. and, the as grown silicon nanowires were treated with various plasmas for the analyses of SiNW on field emission characteristics. It must be noted that the field emissiom current of as-grown SiNW is much smaller than that of carbon nanotubes. Nevertheless, after the hydrogen plasma treatment, the screen effect of the SiNW was reduced and the electronic emissions from the surface of SiNW film were aided effectively. The SiNW will clusted together after treatment of CF4 plasma, the appearance of cluster can increase the surface density and emission sites of SiNW. Additionly, in SiNW, after CF4+H2 plasma treatment, not only the screen effect will be reduced, but also the surface density and emission sites will be increaded dramatically.

In summary, after plasma treatment, the field emission characteristics of SiNWs were impoved obviously, and could be match against that of carbon nanotubes. The SiNW can provide much potential for field emission application.

Keywords : Silicon nanowires (SiNW)、Field emission、plasma、Screening effect

Table of Contents

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