Fabrication of Silicon Nanowires by Metal-Catalyzed Electroless Etching Method and Their Solar Cell Application

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Recently, there has been an increasing interest in the development of silicon nanowires (SiNWs) as a promising candidate for a wide range of applications due to their unique optical and electrical properties. Generally, there are many techniques to fabricate SiNWs such as vapor-liquid-solid (VLS) growth, reactive ion etching (RIE), and metal-catalyzed electroless (MCEE) etching which is the most favorable method. The MCEE method is uncomplicated to control the cross-sectional shape, diameter, length, and orientation. Moreover, this method can also be carried out in a chemical lab without expensive equipment. This study used the MCEE method to fabricate SiNW arrays for improving hybrid solar cell performance. We used SiNW arrays as a part of inorganic semiconductor and used poly(3,4-ethylene dioxythiophene): poly(styrene sulfonate) (PEDOT: PSS) as a part of an organic semiconductor. Finally, the performance of PEDOT: PSS/SiNWs hybrid solar cell with the difference of nanowire length will be compared with PEDOT: PSS/planar Si hybrid solar cell.

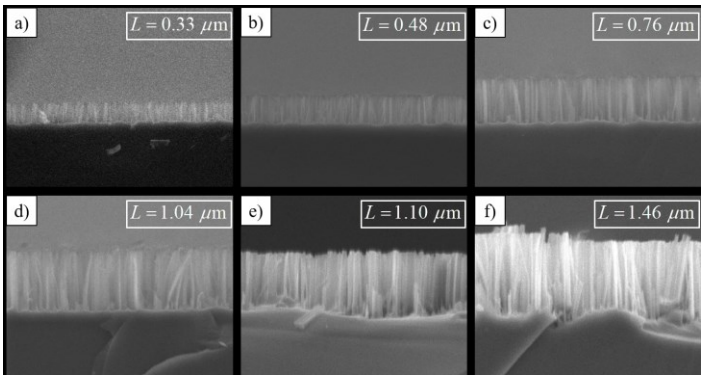

Figure 1. Cross – sectional scanning microscopy of the SiNW arrays with etching time a) 2 min, b) 5 min, c) 8 min, d) 10 min, e) 12 min, and f) 15 min.

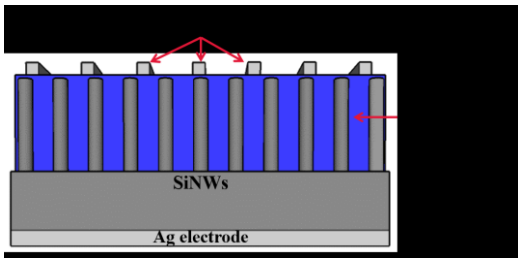

Figure 2. Schematic diagram of PEDOT: PSS/SiNW arrays hybrid solar cell.

References

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