

Growth of SiC Nanowires and Nanocones Using Mixture of Oil Palm Fibres and Rice Husk Ash

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Formation of silicon carbide (SiC) from agricultural wastes is a viable solution in disposing the wastes while being able to produce something worthwhile. SiC exhibits excellent thermal, mechanical, chemical and electronic properties that make it useful in many applications, especially those in harsh environment. SiC nanowires had been studied extensively in many areas of nanoelectronics, nano-optics and nanosensors because of the combined advantages of SiC and nanosize effect [1-3]. 3C-SiC nanowires and nanocones were grown by pyrolysing mixture of acid-treated oil palm empty fruit bunch fibres (TOP) and rice husk ash (RHA), which acted as carbon and silicon source, respectively.

In this study, in order to understand the growth mechanism of SiC nanowires, the effects of RHA amounts and pyrolysis temperature were investigated. When the amount of RHA was increased to 80 % of the mixture, the morphology changed from nanowires to nanocones. Overall, it was found that 40 % of RHA in the mixture was the ideal amount in growing the nanowires with the maximum yield and with the least amount of impurities. When the pyrolysis temperature was raised, there was an increase in the amount, diameter and length of the nanowires. Growth mechanisms of the nanowires and nanocones were proposed by considering the results and supported by thermodynamic data. Due to intimate contact between SiO_2 and C, direct reaction was possible, therefore resulting in solid-state and vapor-solid reactions. Another sub-mechanism is the vapor-liquid-solid (VLS) reaction, in which trace amount of metal species in the rice husk acted as catalyst for the vapor reaction between Si and C species. The overview of the growth process is shown in Figure 1.

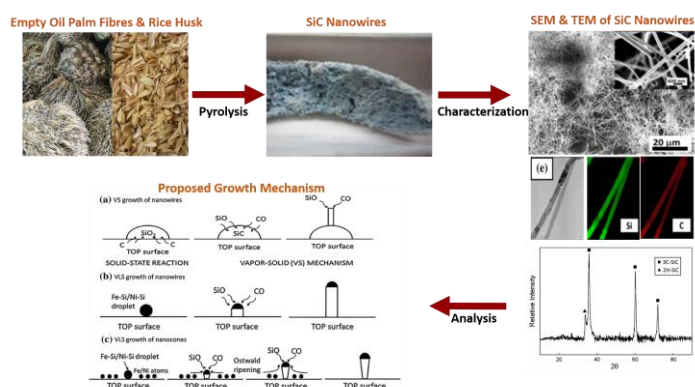


Figure 1 Overview of growth process of the SiC nanowire, fabricated from palm fibers and rice husk .

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