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Silicon Nano-tube fabrication by Using a Macroporous Silicon as Starting Material

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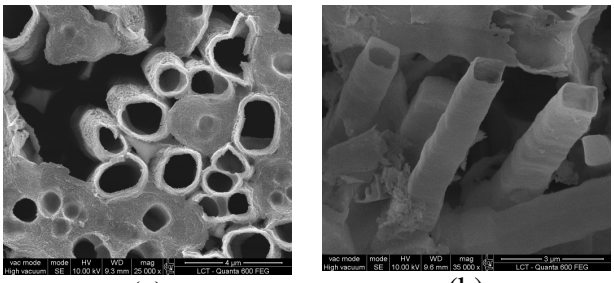
Abstract – In this work, the silicon nano-tubes formation by chemical etching process is reported. The silicon nano-tubes was obtained from the silicon macro porous structure (MPS) by chemical etching process. The nano-tubes were formed by chemical dissolution process of remain silicon crystallites. The nano-tube formation is discussed in the sense of the anisotropic chemical dissolution process catalyzed by the nickel complexes.

The micro and nano-tubes structures showed to have interesting physical and chemical properties with superior performance than of the conventional bulk materials. These features make the nano-tube structures suitable for applications in the very sensible chemical sensor and high performance electronic devices [1]. In general the inorganic nano-tube structures had been obtained throughout growing process using the conventional molecular beam epitaxy (MBE) or by chemical synthetic process [2]. Actually, there is a growing interest for silicon nano-tube fabrication because the integration facilities of the silicon microelectronic technology [3]. However, the silicon tubular structures formation is still a big challenge task.
In this work, the silicon nano-tubes formation by chemical etching process is reported. The silicon nano-tubes was obtained from the silicon macro porous structure (MPS) by chemical etching process in high pH fluoride solution. In this case, first the MPS structure was obtained by electrochemical process in HF:DMF electrolyte solution. After, the MPS sample was immersed in mixture solution of the 0,019$NiSO_4$ and 0.242 MN_4F moieties for 15 hrs. The SEM image, in the Figure 1, shows the silicon nano-tubes structures. The nano-tubes formation is discussed in the sense of the etch-stop process catalyzed by Ni metal. As far we know this experimental process is reported at the first time.



(a) (b)

Figure 1. SEM images of the silicon nano-tubes a) during formation process and b) after final process

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