

Chapter 8

Summary

What does the future for the nanotechnology? From a fundamental viewpoint, we are interested in producing nanostructures with even smaller diameters in order to explore more thoroughly the effects of size on the properties of materials. In this thesis, we have shown that a broad arsenal of chemical synthetic methodologies, in combination with the template method to prepare one dimensional materials, can be used to fabricate a large variety of composite nanostructures, as shown in Figure 8.1. The methodologies used here include stoichiometric reaction; chemical vapor deposition; surface chemistry; carbonization and catalytic reaction. These nanostructured materials are characterization carefully by structural analyses, composition analyses, physical property measurement, and microscopic observation. Another vary important feature of these synthesis methods is that they are all based on fundamental chemical reaction steps, including vapor surface reaction, hydrogen elimination, nucleation, coagulation, exclusion, coupling reaction and disproportionation. The studies of the volatile products generated in the process of the reactions suggest that the reaction pathways are quite complex. Base on the synthesis methods described above, we developed novel fabrication strategy to generate nanomaterials. The summary of these reactions is shown in Figure 8.2.

Considering the strategies employed above, suitable molecular precursors in combination with appropriate methods and conditions are discussed in this thesis. The novel concepts to prepare the nanosized materials have provided potentially useful new synthetic and fabrication routes. We are also developing new methods to prepare one dimensional materials from employing template-synthesized and currently investigating potential applications of these nanomaterials in biosensors, bioencapsulation and energy production. It is clear that if

practical applications are to be realized, methods for mass production template-synthesized nanostructures will be required.

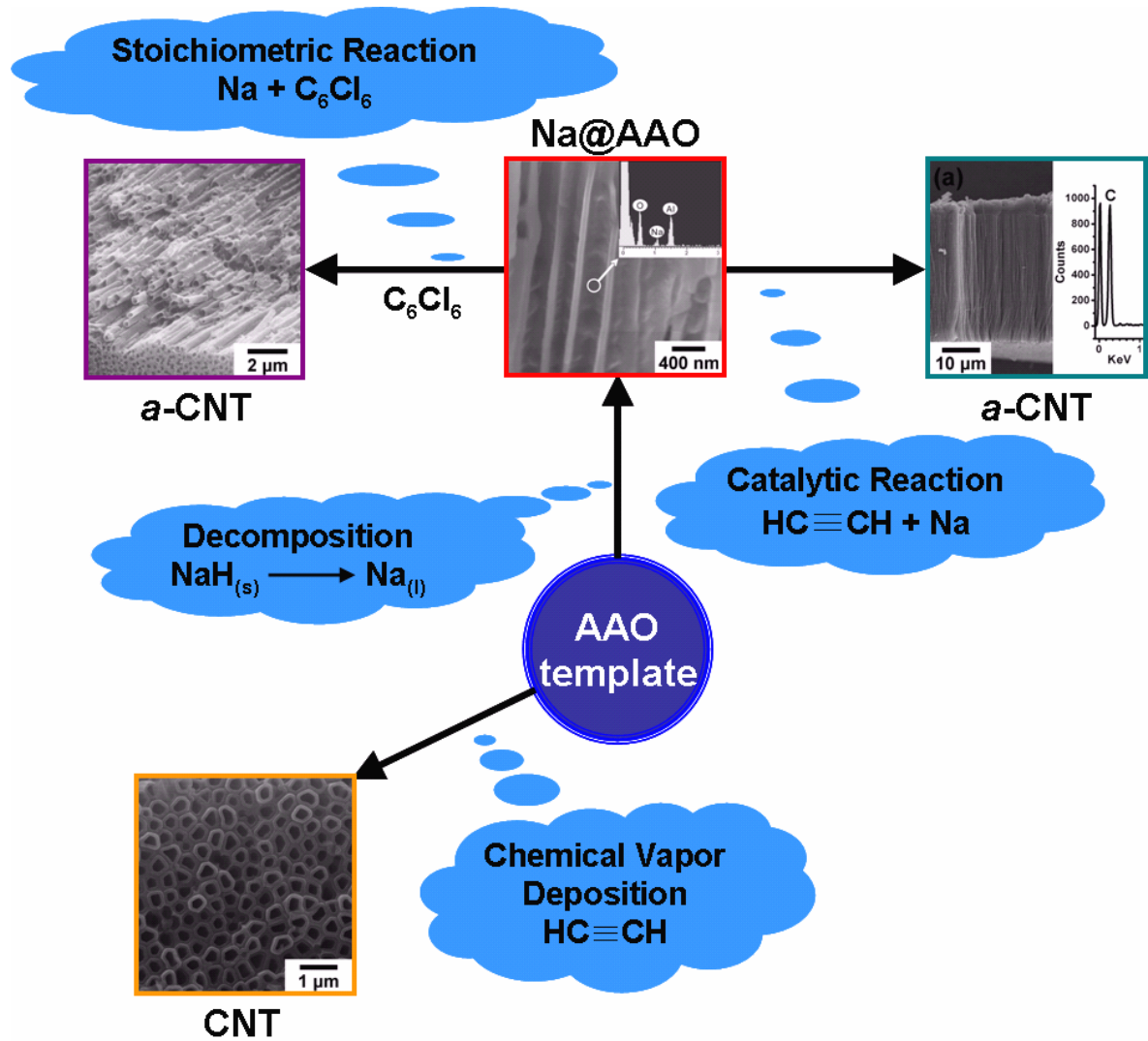


Figure 8.1 Chemical reactions involved in the process of preparing CNT from AAO template.

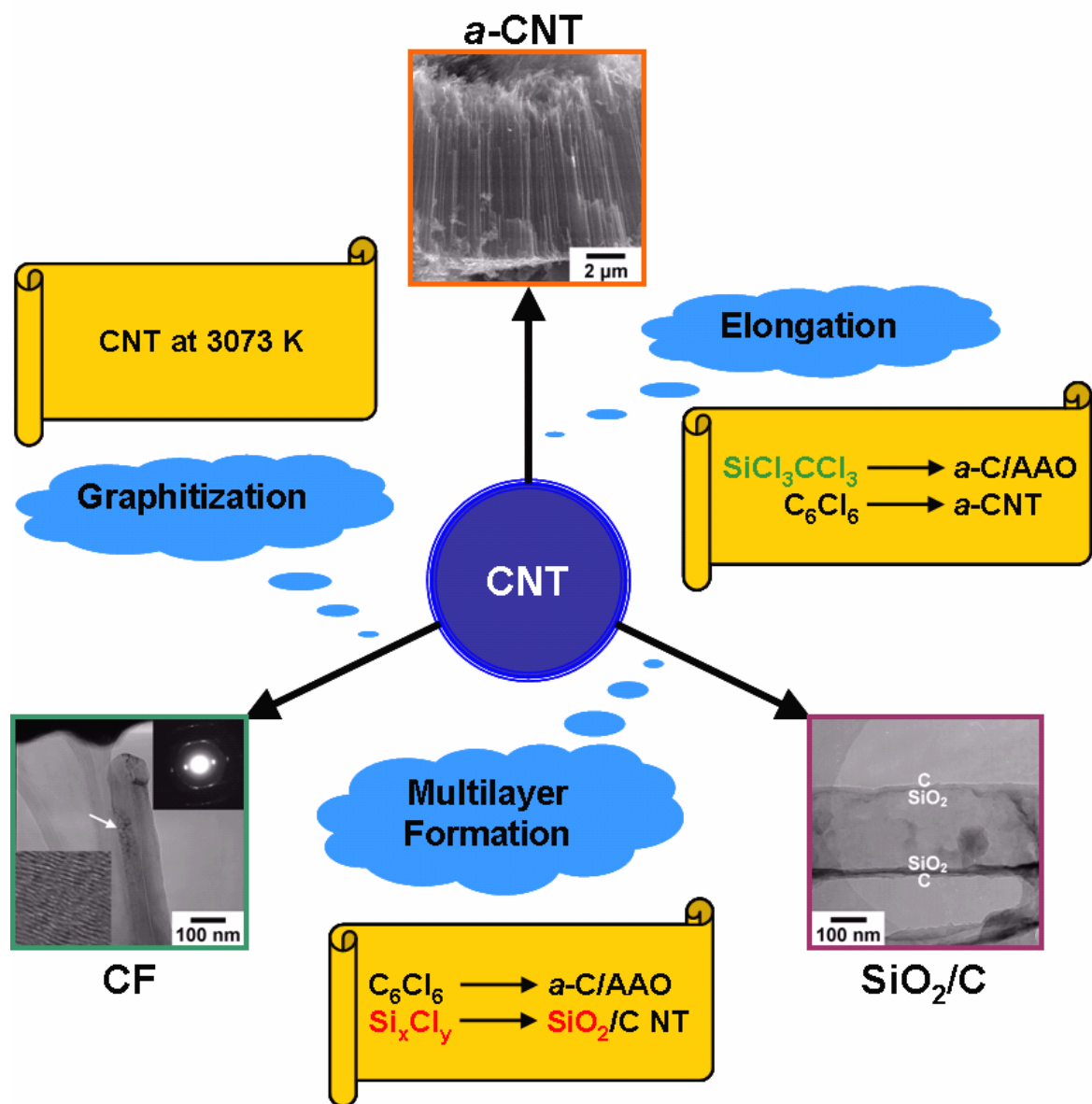


Figure 8.2 Further fabrications of complex CNT based structures.