

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This thesis was focused on the removal of catalyst and silica particles, which has the catalyst support for producing the Single Walled Carbon Nanotubes. The experiment was separated into five parts. The first part was the production of SWNTs by a disproportion of carbon monoxide over cobalt-molybdenum catalyst over silica supported, which called CoMoCAT. The second part was dissolution of catalyst in order to SWNTs and silica was separated after that froth flotation process was used to concentrate the SWNTs in the third part. To get more carbon purity, section four was dissolution of silica particle due to silica was the highest part of the SWNTs and finally we also used froth flotation to concentrate SWNTs.

In the first part, the SWNTs which produced from CoMoCAT process had the carbon purity about 3%. The second part, the highest percentage of catalyst dissolved by hydrochloric acid was 83.95% and 43.98% for Co and Mo, respectively and the optimum condition was 3 hr of sonication time, 6 M of HCl concentration and 50°C of reaction temperature. The next section was froth flotation; this step was used to recover SWNTs from silica particle remaining. Sodium dodecylbenzene sulfonate (SDBS) was used as the key of separation. The highest carbon purity was 6.82% occurred at 0.1 CMC of SDBS, 170 mm/min of air flow rate and pH solution was 3 and from the SEM image we found that the SWNTs particle still rap the silica particle so we were necessary to dissolved silica particle before froth flotation process. Then in part four we used sodium hydroxide to dissolve silica particle; the highest dissolved silica was 53.86% and the optimum condition was 3 hr of snication time, 5 M of NaOH concentration and 50°C of reaction temperature. The Laser Raman was employed to confirm the structure of SWNTs was not changed after treated by either HCl or NaOH. Finally, the froth flotation was came again to concentrate the SWNTs; from the results the highest carbon purity was 71.08% at 0.1 CMC of SDBS, 120 mm/min of air flow rate and pH solution was 5.

5.2 Recommendations

Based on this research work, the following recommendations are suggested for future work:

1. To investigate the nitric acid in the step of catalyst dissolution and compare with the hydrochloric acid.
2. In the froth flotation part, the mixed surfactant was interested to concentrate the SWNTs after dissolved any impurity particles.