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EXPLORING THE PARAMETER FOR ALTERNATING CURRENT ELECTROPHORETIC DEPOSITION OF CARBON NANOTUBES-CONDUCTING POLYMER : A REVIEW

Ahmad Bin Fahmi¹, Intan Syaffinazzilla Binti Zaine² and Dr. Norain Isa³

¹Faculty of Chemical Engineering, Universiti Teknologi MARA, Kampus Permatang Pauh, UiTM Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang

²Faculty of Applied Science, Universiti Teknologi MARA, Kampus Permatang Pauh, UiTM Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang

³Faculty of Applied Science, Universiti Teknologi MARA, Kampus Permatang Pauh, UiTM Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang

**corresponding author: Intan Syaffinazzilla Binti Zaine: intan.zaine@uitm.edu.my*

Abstract:

Electrophoretic deposition (EPD) has been gaining interest due to its great versatility in process parameters for carbon nanotubes (CNTs) and nanocomposite film deposition. The main objective of this paper is to study the parameters effecting formation of CNTs-conducting polymer films using alternating current electrophoretic deposition (AC-EPD) technique. Systematic review have been conducted to accomplish the objective of the study. Stable colloidal suspension can be achieved by using aqueous solution, dispersant and chemical treatment. Good film deposition can be achieved during AC-EPD by using peak to peak voltage, frequency, duty cycle, deposition period and waveform with average value of 15V, 1000 Hz, 80%, 10 minutes and asymmetrical rectangular wave respectively. In the meantime, this work reviews about applications of AC-EPD other than films or coatings making industries as well.

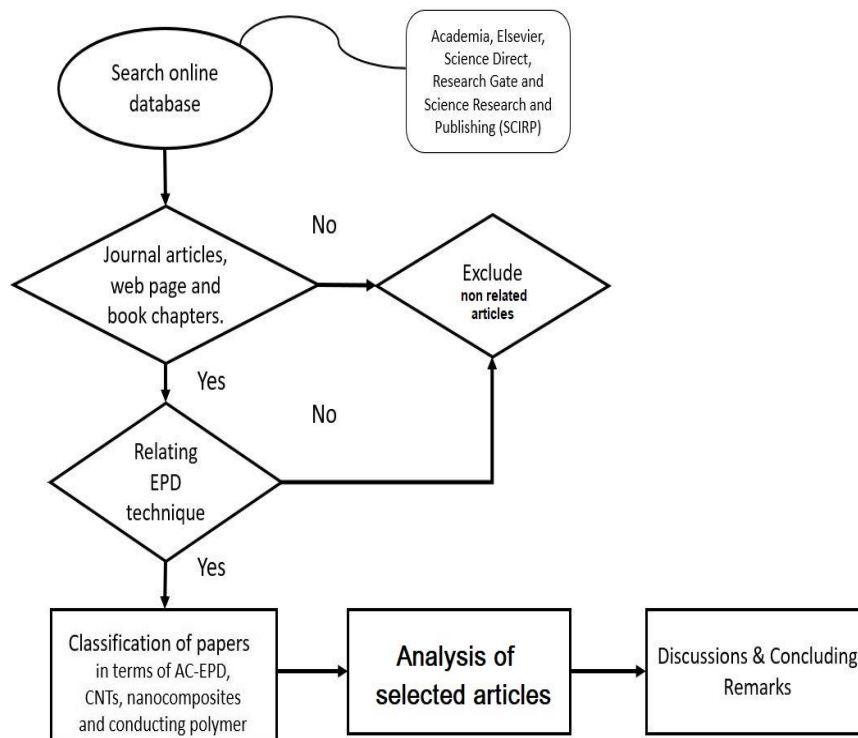
Keywords:

alternating current electrophoretic deposition, carbon nanotubes, conducting polymers, parameters.

Objectives:

- to determine the important parameter for AC-EPD of CNTs-CPs. Factors related to suspension and factors related to AC-EPD operation are the two major factors that will be determined in this study.

Methodology:



Results:

Factors related to suspension:

- *Suspension properties*
- *Dispersant*
- *Chemical treatment*

Factors related to AC-EPD operation:

- *Waveform*
- *Period of deposition*
- *Peak to peak voltage*
- *Frequency*

Conclusion:

AC-EPD is a convenient, eco-friendly, simple and flexible technique to be used for formation of films or coatings. This technique has a simple experimental set up which generally require the use of AC power supply, an oscilloscope, suspension medium, deposition material and electrodes. The thickness of the film can be adjusted desirably by controlling the two major factors which were the factors related to the suspension and factors related to the AC-EPD process. It is advisable to chemically treat the particles with strong acid such as hydrochloric acid before forming a suspension. A stable suspension can be achieved by adding dispersing agent such as malachite green to ensure excellent particle dispersion in the suspension as well. Usage of aqueous solution as medium of suspension is recommendable to avoid hydrolysis of water during the deposition period. The appropriate parameters for a good film formation by AC-EPD are peak to peak voltage, frequency, deposition period with average values of 15 V, 1000 Hz and 10 min respectively. The suitable type of AC wave to be used for AC-EPD are asymmetrical rectangular wave.