CHAPTER 3

MATERIALS AND EXPERIMENTAL METHODS

3.1 INTRODUCTION

In this research, multi walled carbon nanotube (MWCNT) was used to produce reinforced unsaturated polyester resin (UPR) nanocomposite (CNT-UPR nanocomposite). In addition non-covalent functionalized MWCNT was prepared as a means of well dispersion in matrix and to improve the property of nanocomposites as well. Different analysis including thermo-mechanical properties of nanocomposites was performed to understand the nanocomposite behavior and identifies the possible ways in which performance might be improved.

This chapter describes in brief the materials, CNT treatment methods and characterization techniques, nanocomposite processing and testing methods.

3.2 MATERIALS

Orthopthalic unsaturated polyester resin (Polymal) (UPR) was used as matrix materials. Tetra-hydro furan (THF) solvent was used as pre-dispersion media. Methyl ethyl keton peroxide (MEKP) was used as curing initiator. Multi-walled carbon nanotubes (MWCNTs) and hydroxyl functionalized MWCNT (OHCNT) was used as reinforcing nanofiller.

Hyper branched polyester (HBP)(2-2-bis (methylol) propionic acid) generation 2 was used as functional polymer to non covalent functionalization of MWCNT. In addition the natural polymer shellac (SL) was used as coating material for non covalent

functionalization of MWCNT. Figure 3.1shows the commercial grade shellac solution in THF solvent. Additionally the specification and origin of these materials are represented in Table 3.1.

Figure 3. 1: Shellac solution in THF solvent

Table 3. 1: Materials name, specification and origin of materials

Name	Properties	Manufacturer	Country of Origin
Unsaturated Polyester Resin	❖ Viscosity 700-800mPa.S at 25^0C ❖ Volatile content is 30–35%, ❖ Gel time is 8−15 min.	Luxchem Polymer Industries Snd.Bhd.	Malaysia
Multi walled Carbon nanotubes	❖ Produced by moving-bed catalysis technique ❖ Diameter <8nm, length between 10−30 μm ❖ Carbon purity of 95%	Timesnano	China
Curing agent(Peroxides)	❖ Colorless liquid	Sigma Aldrich	USA
HBP	❖ molecular weight 1749.79g/mol ❖ contained 16 hydroxyl groups	Sigma Aldrich	USA.
Shellac	❖ Solid ❖ Polish grade ❖ Light chocolate color ❖ Order less		Bangladesh
Tetrahydrofuran and Acetone		Merk	Germany
Mold releasing agent	Paste and Cream	John Burn & Co. (B'ham) Ltd	England