Strengthening potential of single-walled carbon nanotubes (SWCNTs) in phenolic resin composite was evaluated by characterization of as-purified and phenyl sulfonated SWCNTs, investigation on load transfer capability of as-purified SWCNTs, and characterization of the composites. As-purified and phenyl sulfonated SWCNTs, as well as their composites were examined by Raman spectroscopy, thermogravimetric analysis, scanning electron microscopy equipped with energy dispersive spectroscopy, transmission electron microscopy, X-ray photoelectron spectroscopy and ultraviolet-visible spectrometry. Fabrication of the SWCNT/phenolic resin composite was performed by first dispersing the SWCNTs in ethylene glycol and then homogenizing the mixture with phenolic resin. The ethylene glycol was then evaporated and the SWCNT/phenolic resin composite was cured at 200°C for 1 hour. The dispersion of SWCNTs in the phenolic resin was reduced with higher SWCNT concentrations. Load was transferred from the phenolic resin to purified SWCNTs. This demonstrated the potential to strengthen phenolic resin composite with SWCNT reinforcement. The load transfer efficiency in total tension (0.8%) decreased with an increase in SWCNT concentration, while in total compression (-0.8%), the load transfer efficiency remained constant. At very low strain (± 0.2%), the load transfer efficiency remained constant regardless of SWCNT concentration in both tension and compression. Characterization of the phenyl sulfonated SWCNTs indicated that calcium was introduced as a contaminant that interfered with functionalization of the SWCNTs. The use of contaminated phenyl sulfonated SWCNTs resulted in macroscopic inhomogeneity within the composite.