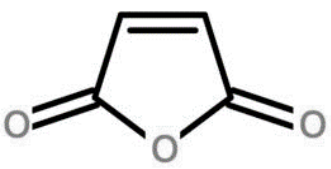
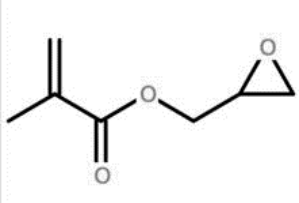
In the step 120, the melt grafting is to place the liquid having nano-zinc particles and a polymer material respectively in a plastic masterbatch process equipment, which has twin screw extraction mechanism and at least six suction holes, where the twin screw extraction mechanism is in a vacuum state. The liquid having nano-zinc particles and the polymer material are respectively placed in the plastic masterbatch process equipment, where the liquid having nano-zinc particles and polymer material have a weight ratio ranged between 1:10 and 1:1. Whereby, the liquid having nano-zinc particles and polymer material are respectively processed to be in a volatile state with the plastic masterbatch process equipment, allowing the volatilized liquid having nano-zinc particles and volatilized polymer material to be mixed and linked together through the twin screw extraction and six suction holes in the process of air extraction. At this point, at least one grafting agent is added therein to perform the mixed graft link, thereby forming a plastic masterbatch having nano-zinc particles, where the addition amount of the grafting agent is between 0.1% and 5% by weight based on the weight percent of the polymer material weight.

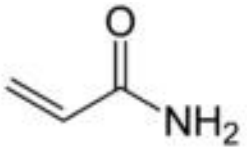
The grafting agent may be maleic anhydride (MAA), which has a molecular formula $C_4H_2O_3$ and chemical formula



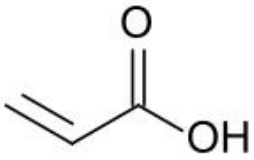
The grafting agent may also be glycidyl methacrylate (GMA), which has a molecular formula $C_7H_{10}O_3$ and chemical formula



The grafting agent may also be acrylamide (AM), which has a molecular formula $CH_2=CHCONH_2$ and chemical formula



The grafting agent may also be acrylic acid (AAM), which has a molecular formula $C_3H_4O_2$ and chemical formula



In a preferred embodiment, the chemical formulae for the nano-zinc particles of the present invention grafted on PVDF, PES, PAN, and PVC are explained, where FIG. 5 shows a formula for the nano-zinc particle of the present invention being grafted on PVDF through maleic anhydride (MAA); FIG. 6 shows a formula for the nano-zinc particle of the present invention added being grafted on PES through maleic anhydride (MAA); FIG. 7 shows a formula for the nano-zinc particle of the present invention being grafted on PAN through maleic anhydride (MAA); and FIG. 8 shows a formula for the