

## Lignin in PVC composites Applications

Lignin is nature after cellulose, the second largest amount of natural polymers. Preparation of lignin polymer composites, is abundant renewable resources that can be effectively utilized ways. Lignin and PVC and other materials prepared by blending synthetic polymer composite material, so that the two complementary performance, the overall improvement in the use of materials properties. For plant fiber-based materials research, conducive to the realization of lignocellulosic biomass feedstock in the field of polymer materials for petroleum feedstocks effective alternative for improving biomass utilization levels, ease the oil crisis of resources and protecting the environment is important.

Lignin in PVC added to improve the composite Vicat softening temperature, reducing its deformation capacity, to some extent, the increased use of composites temperature range. Overall, the addition of lignin in PVC, composite materials processing did not give a negative impact on performance, to a certain extent, also played a positive role. But PVC lignin poor compatibility between the two phases, which makes the mechanical properties of the composite material is affected. PVC / lignin composite tensile strength, elongation at break and impact strength in the composite material with lignin addition amount increases. Meanwhile, the thermal stability of composites decreased slightly, flame retardant also been some negative impact.

Different wood species of alkali lignin mechanical properties of the composites is not obvious, but the lignin extraction methods for composites greater impact.

Acetic acid lignin for the preparation of PVC-based composite material, less impact on the mechanical properties. Lignin heterogeneity of the structure, will reduce the overall performance of the composite material.

Alkali lignin of low molecular weight fraction of the composite plastics beneficial in PVC matrix can obtain good dispersion, is conducive to the improvement of mechanical properties of composite materials, while reducing the thermal deformation of composite materials will also help; but with the highest molecular weight fractions of lignin composites prepared, the best thermal stability.

Therefore, industrial alkali lignin preparation of composite materials, it is necessary to control the molecular weight, to keep them in a suitable range. Lignin by freeze-drying to improve the specific surface area, beneficial to the PVC matrix in uniform dispersion. Preparation of lyophilized lignin composites, tensile strength, elongation at break and impact strength than the composite vacuum dried lignin material are improved. By reaction hydroxypropyl lignin macromolecules into branched chain, could lower the T<sub>g</sub>, increase its molecular chain mobility. Hydroxypropyl lignin of the composite material, the tensile strength, elongation at break and impact strength are improved. However, the structural characteristics of lignin, especially relative molecular mass, the decision is still a key factor in the performance composite materials.

Lignin and methyl methacrylate (MMA) graft product in PVC / wood flour composites showed

good interfacial modification effect. The grafted product of wood processing, the surface becomes more hydrophobic matrix in PVC to obtain good dispersion. When the MMA monomer ratio of 2:1 with lignin, grafted products amount of 2%, the tensile strength and impact strength compared to untreated wood composites prepared, were increased by 18.7% and 35.2%. In addition, the graft products on wood surface treatment, the composite material can also increase the hydrophobicity. In order to deal with wood grafted products after the composite flow curve maximum torque is slightly higher plasticizing time is slightly shorter. But overall, the graft did not give the product added composites processing rheology much impact. Mannich reaction in the synthesis of cationic lignin amine, in PVC / wood composite materials also exhibit good interfacial modification effect. Lignin amine with an amino silane coupling agent-treated wood composites prepared, the mechanical properties of the level of increase is almost comparable. When the wood mass of 2% lignin amine (nitrogen content of 8.18%) on the wood surface treatment, the tensile strength and impact strength compared to the untreated sample increased by 21.0 percent and 43.9 percent. The lignin amine nitrogen content in the interfacial modification effect is not obvious.

Furthermore, wood lignin amine surface treatment can also reduce the water absorption of the composite material. Lignin structure of the actual processing of the composite material there is a certain effect, if the addition amount in the system is very small, still may cause changes in rheological properties of the composite material. But as interfacial modifier added in small amounts, not actual production caused a greater impact.