

Effect of Hydrophilic Polymers on the Hydration of Polyacrylonitrile

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Hydration of polyacrylonitrile(PAN) with water depresses the melting point(T_m) of PAN below the decomposition temperature enough to permit melt extrusion.

Among several factors affecting hydration of polyacrylonitrile(PAN), the suppression of sudden inflation of bubbles is recognized to be the most important one. To avoid the bubble inflation, two methods may be adopted; depression of spontaneous vapor pressure by lowering T_m of PAN and retardation of evaporation rate of water out to the system.

In the binary melt system of PAN and water, the hydrophilic polymer is expected to suppress the sudden evaporation of water while the solvent or salt possessing affinity for PAN to depress T_m of PAN by conferring a synergistic effect on the hydration process.

This study investigates the effect of these ingredients on the hydration process of PAN through DSC analysis.

As hydrophilic polymers, polyvinyl alcohol, polyacrylic acid, starch, polyethylene oxide, sodium carboxy methyl cellulose(CMC) were tested. The T_m of PAN shifted to the higher temperature with increasing the content of these polymers in water, suggesting that the absorption of water by these polymers and hydration reaction of PAN take place in a competitive manner. On the other hand, addition of hydrophilic polymers has little influence on the crystallization temperature(T_c), which indicates that these polymers have little compatibility with PAN.

Addition of solvent and salt further reduced both T_m and T_c of PAN, showing that these ingredients bring about more enhanced plasticization of PAN.