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Dyeing Optimization with Metal Complex Acid Dyes for Nylon Fabrics

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Abstract: In general, acid dyes have high affinity toward nylon fibers, meaning that the dyes quickly bind with the polymer. Thus, if the dye is absorbed by the polymer too quickly, the nylon fibers can absorb the dye unevenly and not exhibit a constant shade or color. Consequently, nylon fibers are typically dyed with acid dyes under carefully controlled conditions in order to control the rate at which the dye is absorbed by the polymer. In particular, the temperature and the pH in the dye bath are usually monitored and regulated during the process. This article is focused on: 1. the relationship between different pH values and the exhaustion rates of metal complex dyes, 2. the relationship between different acids and the color strength of metal complex dyes, 3. the effect of pump flow on fabric running speed and level dyeing property. Our results showed that if the traditional acid agent was replaced with pH sliding agents, the critical dyeing range (C_R) would be changed from 30 ~ 60 °C to 50 ~ 60 °C, the final dyeing temperature (T_{90}) could be changed from 71 °C to 86 ~ 95 °C and then level dyeing fabrics was obtained. Increased dyeing pump flow and nozzle pressure caused to increased running speed of the fabric and shortened time required for the dyeing process by 20 min. It can help saving energy and costs for the dyeing process.

Key Words: [Nylon fibers](#), [pH value](#), [Metal complex dyes](#), [pH sliding agent](#), [Critical dyeing range](#)

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