# The Effect of Hydrophobic Interaction for the Binding of Methyl Orange and its Homologs by Nylons

Seong Han Song and Yong Jin Lim

Department of Dyeing and Fnishing, College of Engineering,

Kyungpook National University

To look into the effect of hydrophobic interaction for the dyeing of nylon with acid dye, powdered nylons, nylon 66, nylon 69, nylon 610 and nylon 612 were prepared as a model of amorphous polymer.
The bindings of methyl orange, ethly orange, propyl orange and butyl orange by nylons have been examined quantitatively at 10, 15, 20, 25, 30, 35 and 40 ℃.

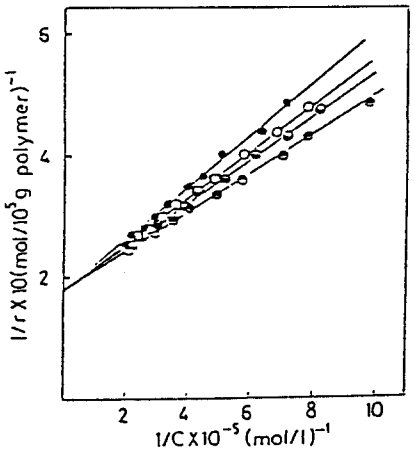


Fig. 1.
Relationship between 1/r and 1/c for the binding of butyl orange by nylon 612 at pH 7 : 10°C ; ( ○ ) 20°C ; ( ◓ )
30°C ; ( ◒ ) 40°C ; ( ● )

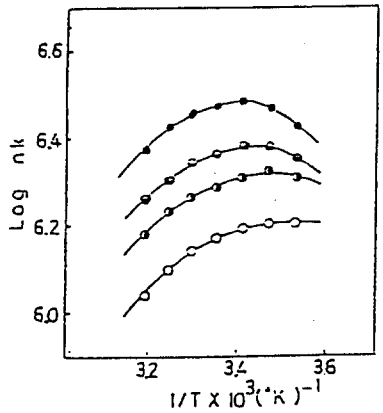


Fig. 2.
Relationship between log nk and reciprocal absolute temperature for the binding of butyl orange by powder nylons at pH 7 .
nylon 66 ; ( ○ ) nylon 69 ; ( ◑ )
nylon 610 ; ( ◒ ) nylon 612 ; ( ● )

The first binding constant, $k_1$ (=nk) in the binding can be calculated from the rearrangement of the Langmuir isotherm, eq.(1) and thermodynamic parameters can be obtained from the first binding constant and its temperature dependence.

$$1/r = 1/nk \cdot 1/c + 1/n \qquad \text{---------- (1)}$$

The binding ability of the polymer for the small cosolute was enhanced with an increase of the hydrocarbon moieties in nylons and acid dyes. Moreover, a bell shaped curve appeared in the binding of propyl orange-nylon 610, propyl orange-nylon 612, butyl orange-nylon 69, butyl orange-nylon 610 and butyl orange-nylon 612 when the first binding constants was plotted as a function of temperature. This peculiar temperature dependence of the first binding constants shows that the enthalpy of the binding varies from a negative value to a positive one. This behavior can be accounted for in terms of more hydrophobic effect involved in the binding process.

Thermodynamic parameters showed a linear relationship with the number of methylene group of dibasic acid in nylons.

It is reasonable to conclude that not only the electrostatic attraction but also the hydrophobic interaction plays a significant role in the dyeing of nylon with acid dye.