Based on the observed facts described below a rate expression was derived which could well explain the influence of experimental variables.

1. Besides the main reaction (1), the dehydration of $CH_3OH \cdot BF_3$, producing dimethyl ether and water, occurs, *i. e.*

$$CH_3OH \cdot BF_3 \rightleftharpoons \frac{1}{2}CH_3OCH_3 \cdot BF_3 + \frac{1}{2}H_2O \cdot BF_3$$

Since this equilibrium is quickly attainable, $CH_3OH \cdot BF_3$ is reproduced by the reverse shift according as the consumption of $CH_3OH \cdot BF_3$ proceeds by the reaction with CO, which then reacts successively with CO to produce $CH_3COOH \cdot BF_3$.

Thus the addition of $H_2O \cdot BF^3$ to the reactant leads to the increase of intial rate of $CH_3COOH \cdot BF_3$ production (based on charged $CH_3OH \cdot BF_3$). For example, 1.5 : 1 mole ratio mixture of $H_2O \cdot BF_3$ and $CH_3OH \cdot BF_3$ gives 90 mole % yield of $CH_3COOH \cdot BF_3$ in $1\frac{2}{3}$ hours under 1100atm. of CO at 200°C, while 1 : 1 mole ratio mixture of $H_2O \cdot BF_3$ and $CH_3OH \cdot BF_3$ takes nearly $5\frac{1}{2}$ hrs. to reach 90 mole % yield under the same condition.

2. When 1.5 : 1 mole ratio mixture of $H_2O \cdot BF_3$ and $CH_2OH \cdot BF_3$ is used as the starting material under about 1000atm. of CO, the optium reaction temperature lies at 200°C.

If the reaction temperature is raised to about 210°C, quick occurence of the side reaction to produce a tarry matter reduces the final yield of $CH_3COO \cdot BF_3$.

3. The result of the experiment on the effect nf pressure at 200°C, when 1.5 mole ratio mixture of $H_2O \cdot BF_3$ and $CH_3OH \cdot BF_3$ is used, shows that the yield of $CH_3COOH \cdot BF_3$ is 93 mole % in 2 hrs. In the base of 1100 atm. of CO, and 86 mole % in 7 hrs. in the case of 455 atm.

4. Reaction rate can be expressed by the next formula (3) very well:

$$dy/dt = k \cdot x . f_{CO}, \quad (3)$$

where, x = existing $CH_3OH \cdot BF_3$ (mole)/charged $CH_3OH \cdot BF_3$ (mole), under equilibrium with ether and water, y = produced $CH_3COOH \cdot BF_3$ (mole)/charged $CH_3OH \cdot BF_3$ (mole), f_{CO} = fugacity of CO, k = rate constant.

k's are calculated to be 1.7×10^{-5} atm.$^{-1}$ min.$^{-1}$ at 200°C, 0.89×10^{-5} atm.$^{-1}$ min^{-1} at 180°C, 0.33×10^{-5} atm.$^{-1}$ min.$^{-1}$ at 160°C, and the activation energy is obtained to be 15 Kcal/mole.

Studies on the Coefficient of Kinetic Friction of Fiber

Waichiro Tsuji and Masazo Imai

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Report of the Japan Institute for Research on Chemical Fibers, Kyoto Univ. (*Kasen Koenshu*) **14**, 53 (1957)

The apparatus to estimate the coefficient of static and kinetic flriction of fibers based upon the Röder's method [H.L. Röder, *J. Text. Inst.*, **44**, T 247 (1953)] was costructed. With this apparatus coefficients of static and kinetic friction of viscose and vinylon fibers treated with surfactants of various types. Minimum values of the coefficient of friction were observed at the velocity of about 1 m/min. with fibers treated with anionic and cationic type surfactants as well as nonionic type. This discrepancy to the result reported by Röder was discussed.

The convenient apparatus to estimate the coefficient of static and kinetic friction of yarn was constructed using the loading pendulum of K.S. Senimeter (a single fiber tensile tester). Results obtained with this apparatus were compared with results obtained with Röder type apparatus or the loading weight method and some differences were observed.

Studies on the Second-Order Transition Temperature of Polyvinyl Alcohol. (I)

Influence of Water on the Second-Order Transition Temperature of Polyvinyl Alcohol

Yasuo SONE and Ichiro SAKURADA
(Sakurada Laboratory)

Chemistry of High Polymers (*Kobunshi Kagaku*), **14**, 574 (1957)

The relation between the second-order transition temperature Tg and the water content of polyvinyl alcohol was discussed. The water content of samples of polyvinyl alcohol filament were 0, 1.8, 2.4, 8.6, 14.0, 25.0, 35.9, 48.5, 61.6% respectively. The Tg of completely dried sample was 73°C, but the temperature fell gradually with increasing water content of samples. Another transition temperature Tg′ were observed by the samples whose water content were greater than 8.6 %.

Studies on the Second-Order Transition Temperature of Polyvinyl Alcohol. (II)

Influence of Rate of Heating and Degrees of Polymerization on the Second-Order Transition Temperature of Polyvinyl Alcohol

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(Sakurada Laboratory)

Chemistry of High Polymers (*Kobunshi Kagaku*), **14**, 577 (1957)

At first the influence of the rate of heating on the second-order transition temperature of polyvinyl alcohol (PVA) was studied. The samples used in this series were air dried PVA filament and completely dried PVA film. In no case the influence of the rate of heating were observed. In the second series of this