16. Plasticity of Bentonite Clay

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It was reported recently that the bentonite clay swelled with water showed peculiar slip bands under compression by two parallel planes [Goto and Hirai: This Bull. **20** 48 (1940)].

The direction of the slip bands corresponds to that of the maximum shearing stress which inclines at 45° in the direction of the force applied. When a block of clay is closed in a test box of shearing (a soil testing apparatus) under a vertical (P) and a horizontal shearing force (F) the threshold value (F_0) of the shearing is generally given by the relation

$$F_0 = P \tan\varphi + \nu \quad \cdots\cdots (1)$$

where φ is the angle of internal friction and ν is the cohesion force. For the bentonite clay swelled with water, it was confirmed that $\varphi = 0$ or $F_0 = \nu$. And ν changes its value with the amount (W) of water added, holding the relation

$$\nu = Ae^{-bw} \quad \cdots\cdots (2)$$

where A and b are constants. The analogous relation has been found between the yield value (S_f) of plastics and the amount of the plastizer [Kanamaru: Chem. and Chem. Ind.; **2** 246 (19449)). Thus it is suggested that the threshold value of shearing stress or cohesion force ν, corresponds to the yield value and water acts as a plastizer in this case.

It was found that when the aqueous solution of NaCl or alcohol at various concentration is used as a plastizer instead of water, the relation (2) is somewhat modified. This means the decrease of the hydrophilic property of the bentonite.

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17. Sedimentation Volume of Powders

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In order to investigate the lyophilic properties of various powder in benzene, the sedimentation velocity v and its final volume per gram V_1 were observed. v of ZnO_2, starch or carbon black in benzene begins to decrease steeply at the sedimenting volume V_2, which is several times as large as V_1, and when V_2 is reached, the rest angle appears and increases rapidly as sedimentation proceeds. This means that the interaction or the friction between the particles begins to