Bingham plastic flowing down inclined plane

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Non-Newtonian fluid like Bingham plastic is commonly used in the chemical industry. Among flow properties of non-Newtonian fluid, especially, the yield stress is critical in that it can be the threshold to determine start point of flow. In this study, we measure the yield stress through the simple experiment using inclined plane. The yield stress on the inclined plane is simply expressed in terms of some properties: the density of the fluid (ρ), the height of the fluid layer (h) and the angle of inclined plane from the ground (Θ).

$$\tau_{xz}=\rho gh\cdot\sin\Theta$$

Our simple device can measure it by only tilting the plane. Capturing the moment of flow with camera, we extract the data sets of height and inclination through image analysis. Furthermore, we add reliability by performing statistical analysis. Finally, we compare the results of our device with those of the existing rheometer.