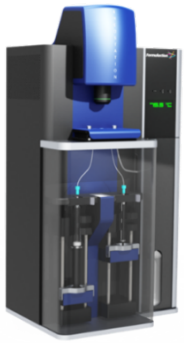
Mimicking real life behavior of common cosmetic products



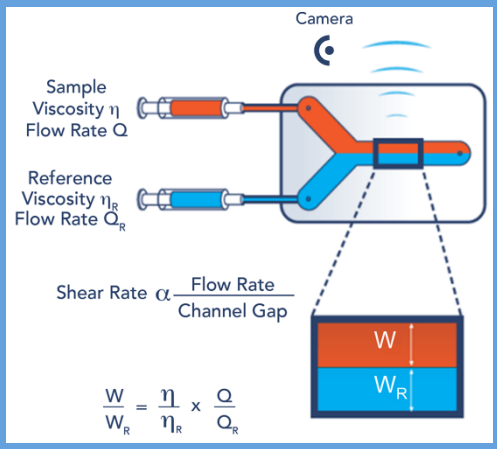
Introduction

The texture, practical application and final customer appreciation of many cosmetics are governed by their rheological properties. During the formulation and designing process, it is essential to consider viscosity dependence to shear rate applied when handling these products. Most are complex formulations that need to embrace various rheological behaviors depending on desired customer use. Current available technologies do not allow to fully study the behavior of home and personal care products as they are limited by accessible shear rates. Following table presents estimated shear rates for some common applications.

Application	Shear rate
Spraying	$10^5\ s^{-1}$
Spreading on skin	$10^4\ s^{-1}$
Rubbing	$10^4\ s^{-1}$
Pouring	$10^2\ s^{-1}$
Squeezing out of dispenser	$10^3\ s^{-1}$

Reminder on the technique

FLUIDICAM RHEO uses a co-flow microfluidic principle to measure viscosity of various products. A sample and viscosity standard are introduced together in the microfluidic channel (typically 2.2mm X 150µm) where they undergo strong confinement. Applied shear rate is simply adjusted by a computer-controlled syringe pump. Under these conditions, the interface position is related to the viscosity ratio between the sample and the reference. Images of the resulting laminar flow are acquired thanks to an integrated camera and the viscosity of the sample is automatically extracted as a function of shear rate and plotted directly in the software giving a resulting rheological curve.



Experimental results

Several cosmetic products (hair gel, shampoo, sunscreen, make up foundation) were tested at wide shear rate ranges (500 to 20 000 s^{-1}). Samples were simply introduced into adapted syringes which later were clipped to the syringe holders and images (example below) were acquired at each shear rate.