Sunscreen Formulation – Faster and Better Investigation of Raw Material and Process Space

Alejandro Perez, Chemspeed Technologies AG, Augst, Switzerland

Personal Care

Introduction

Today's market demands more efficient, elegant and safe sunscreen products. The intrinsic difficulties associated to sunscreen formulation (process complexity and diversity of -up to 50- components) is increased by consumers expectations. New products must feature additional properties, such as water resistance, easy-use, skin hydration or anti-oxidant activity. Besides, target market specialization together with the increasingly demanding toxicity regulations (e.g. recent bans on D4 and D5 siloxanes) highlights the necessity of new product formulation and reformulation of existing products.

Objective

More efficient investigation of both raw material and process space is possible with the Chemspeed fully automated and unattended formulation workstation.

Results

An exemplary automated sunscreen formulation workflow is depicted in *Figure 1*.

Process space investigation: Complex formulations depend on several parameters. Chemspeed technology allows continuous real-time monitoring and control of all formulation parameters, including internal and jacket temperature, shear rate and stirring power consumption, scraping speed, reflux and pH in an inert atmosphere if desired (*Figure 2 and 3*). Chemspeed's unrivalled exchangeable overhead dispensing tools allow dosing of solids, powders, liquids, high viscous materials, pastes and waxes to the milligram resolution WHILE the formulation is being processed.

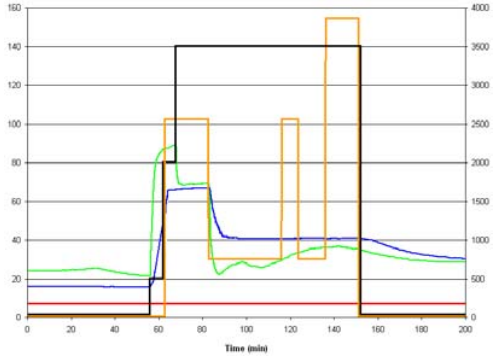

Figure 2 – High-Output formulation. Internal vessel temperature in °C (blue), jacket temperature in °C (green), pH (red), scraping speed in rpm (orange) and shear rate in rpm (black)

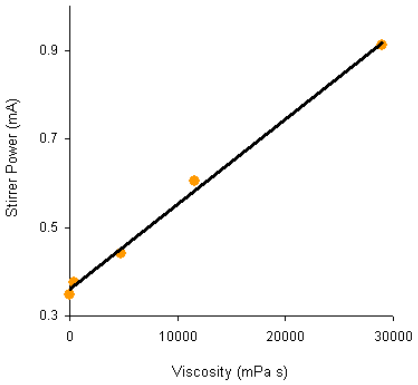

Figure 3 – Stirrer power consumption vs viscosity correlation. Real-time viscosity measurement and adjustment is possible

Raw material space investigation: Screening new ingredients is a time consuming and tedious process that requires several hundred formulations. Parallel and automated formulation allows screening new materials in an easy and cost-effective way by introducing systematic variations of one or more component per formulation vessel.

Summary

Formax, Chemspeed's software-driven robotic platform for personal care products formulation (*Figure 4*), is an essential tool in high-throughput, high-output formulation, boosting the development and optimization of your products in nowadays demanding market.

Figure 4 – Formax, Chemspeed Automated Formulation Workstation and Gravimetric dispense WHILE processing

Figure 1 – Exemplary Automated Sunscreen Formulation Workflow