TA Instruments

Thermal Analysis & Rheology

RHEOLOGY SOLUTIONS

CORRELATION OF STRUCTURE DIFFERENCES TO PROCESS VARIABLES FOR SERUM SEPARATION GELS

PROBLEM

During the development of a new gel product for use in serum separation, the manufacturer found that the integrity of the final product varied. In certain cases, the desired gel structure was obtained initially and maintained during use. In other cases, the gel bled (exuded) with time. The manufacturer believed that this gel variability was related to processing variables.

SOLUTION

Gel samples representing good and bad performance were evaluated using oscillatory tests on a Controlled Stress Rheometer. In those tests, a stress (force) was applied to the material in an oscillatory (sinusoidal) manner. The strain (displacement) which resulted, as well as the phase difference between the applied stress and measured strain, were determined and used to calculate a quantitative value called "tan δ", which is the ratio of loss and dynamic modulus and is larger for more liquid-like materials.

Figures 1 and 2 show the comparative tan δ results for the good and bad gels as a function of temperature. Figure 1 is the result on the gels "as received". After the initial heating, the samples were cooled and run a second time. Those results are shown in Figure 2. The good gel exhibited a lower tan δ profile in Figure 1 and its tan δ profile did not change substantially on reheating. The bad gel, on the other hand, had more liquid-like properties in Figure 1 before converting to a gel behavior similar to the good gel on reheating. These results caused the manufacturer to review the manner in which the gels had been prepared. The difference in behavior was ultimately attributed to mixing and thermal history variations.

Figure 1. TAN DELTA VS. TEMPERATURE (Separation Gels - As Received)

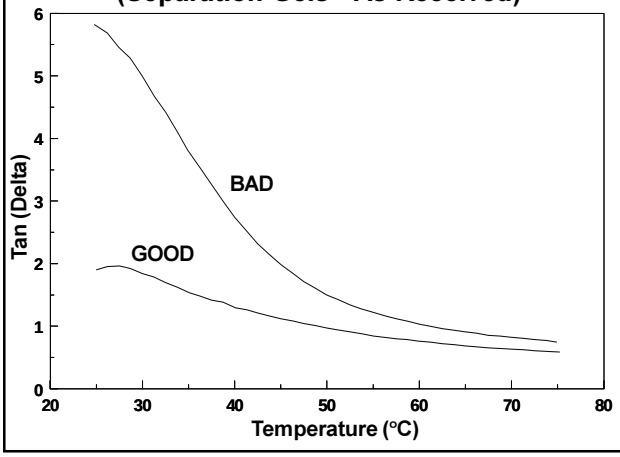
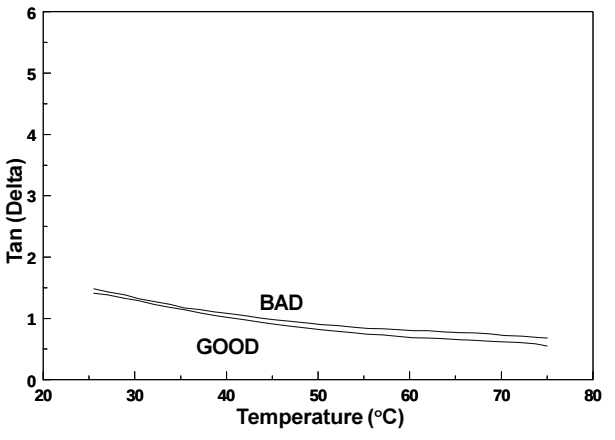


Figure 2. TAN DELTA VS. TEMPERATURE (Separation Gels - Second Heat)



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