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Life time testing of index matching gel for the AMP company

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appendix

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Keywords

Summary

The ageing behaviour during 40 days and the life time estimation of the gel of the AMP company were investigated. The gel was delivered on the 16. mai 1999.

The performance degradation of the gel is very low.

Weight loss at 120°C isotherm ageing after 40 days was 0.04 g or 0.6%. The weight loss rate decreases with time.

Life time of 203 years for 40°C was estimated.

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1 Introduction

AMP company asked NWS-ENG-TA-OSP to make life time prediction tests on one gel. The mechanical and optical performance degradation during the isotherm and non isotherm ageing should be observed. The isotherm ageing at 120°C and during 40 days as well as non isotherm ageing for the life time estimation should be done.

1.1 Terms and abbreviations

IR infrared

1.2 Referenced documents

- [1] Flynn J.A., Wall L.A., Polymer Letters 4 (1966) 323-328
- [2] Toop D.J., IEEE Transactions on Electrical Insulation E 1-6 (1971) 1
- [3] TA Instruments Application Letter TA-125 (1994)

2 Accelerated testing and life time estimation

2.1 Test program

Following test program has been established.

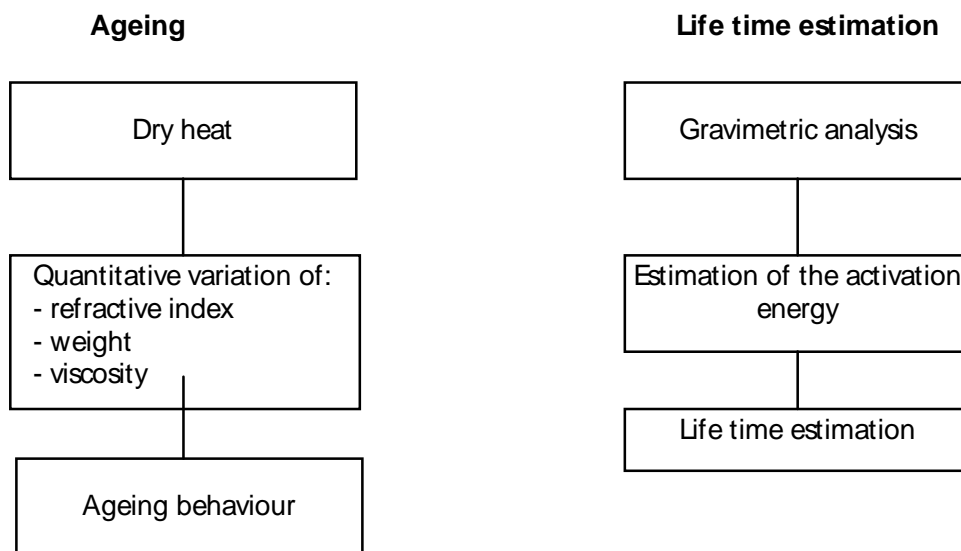


Figure 1: Test program

2.1.1 Weight variation

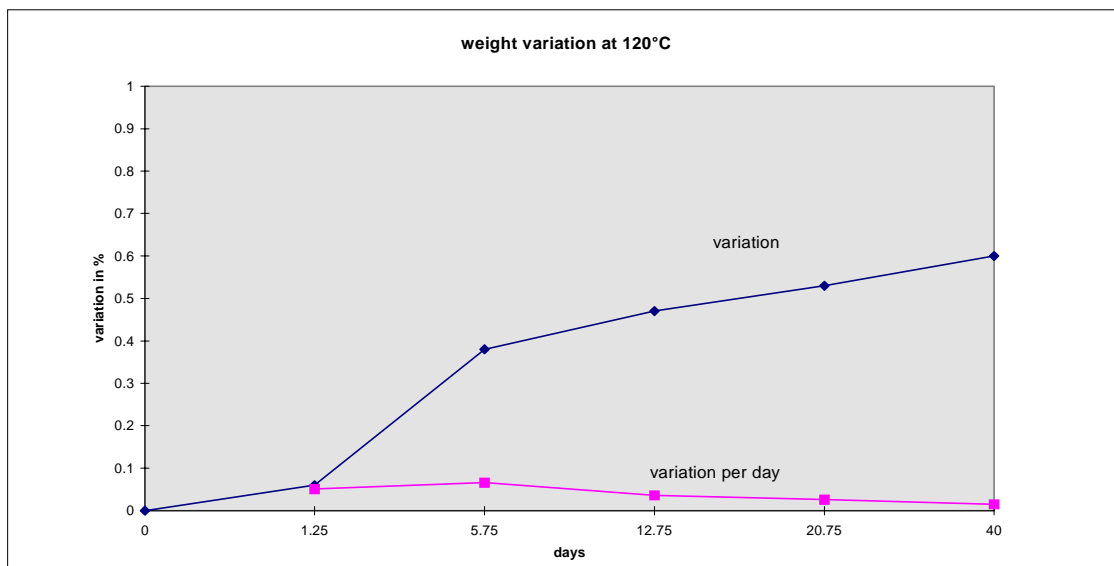


Figure 2: Weight variation in [%] at 120°C

The weight loss is very low and its rate decreases with time.

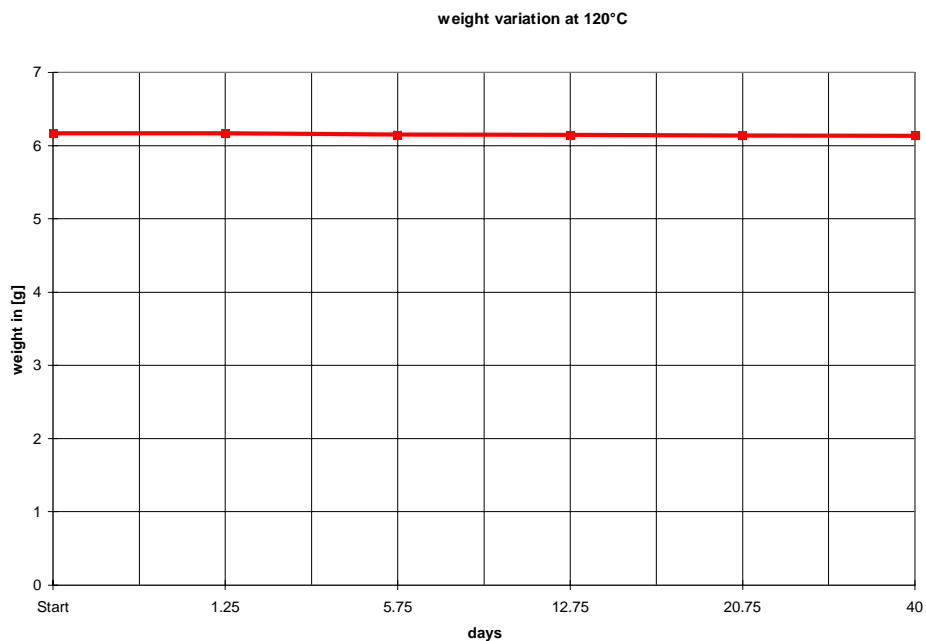


Figure 3: Weight variation in [g] at 120°C

Fig. 3 shows very little variation of the weight during isotherm ageing of the gel.

Because of its very stable behaviour at 120°C it was not necessary to test the IR spectrum before and after ageing.

2.1.2 Refractive index variation

Refractive index was measured at the wavelength $\lambda=589$ nm of sodium D-line:

$$n_D^{20^\circ C} = 1.4609$$

Refractive index variation was not observed.

2.1.3 Viscosity

The viscosity of the gel was not changed after the ageing.

2.1.4 Life time estimation

The theoretical background for determination of kinetic values from non isotherm gravimetric measurements are given in Chapter 1.2.

The method is based on the assumption that the weight loss of specimen is direct related to performance degradation of the gel.

The following table 1 shows activation energy and life time estimation for the gel at different temperatures and for weight reduction of 5%.

Table 1: Activation energy and life time estimation

Activation energy [kJ/mol]		Temperature °C					
		40	50	60	80	100	120
96	life time [years]	203	66	22	3.1	0.5	0.1

3 Conclusion

The gel of AMP shows very stable behaviour during the isotherm and non isotherm ageing. The life time of 203 years at 40°C indicates that the performance degradation of the gel is very low.