60% of the films reduce peak points in excess of 0.04#

Within the H1 range of 0.04#

down to 0.001#

The yield stress of the films decreases significantly with decreasing stress.

The dimensional changes and thermal coefficients

are important factors in the dimensional stability of the films. A higher coefficient of thermal expansion is observed in the lower stress range. It is clear that there are no significant changes in the linear coefficients of thermal expansion of the films. From these results, it is evident that the films exhibit a high dimensional stability.

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Discussion and Conclusions

Cellulose materials can be used for the reinforcement of composites. Similar results were obtained for the composite of cellulose and thermoplastic materials. The results showed that the composite has a higher modulus of elasticity and a higher strength compared to the pure cellulose material. The composite also has a higher damping factor, which is important for applications where vibration reduction is required.

Thermal Cycling of Materials

The number of thermal cycles that the material can withstand without degradation is an important factor in the design of composite materials. The material was subjected to thermal cycling between 100°C and -10°C, and the number of cycles to failure was recorded. The material was found to withstand up to 500 cycles without any significant degradation. This is an important finding for the potential use of this material in high-temperature applications.

The thermal properties of the material were also investigated. The thermal conductivity and the specific heat capacity were measured, and the results showed that the material has a higher thermal conductivity and a lower specific heat capacity compared to the pure cellulose material. This makes the material suitable for applications where fast heat transfer is required.
Chapter 12

Probing the Factors That Control Degradation in Museum Collections of Cellulose Acetate Artefacts

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Cellulose acetate artefacts in museum collections cover a period from the early 1900’s to the present day. Conservators have observed that certain of these objects are showing signs of warping, crazing, cracking, discoloration and shrinkage accompanied by a strong smell of acetic acid. Previous studies on cellulose nitrate artefacts show a correlation existed between the residual sulfate from manufacture and subsequent susceptibility to degradation. A parallel study of the accelerated ageing of modern samples of cellulose acetate and also selected artefacts dating from the 1940’s has been carried out. The tests involved exposure of the objects to temperatures of 35 °C, 50 °C and 70 °C and relative humidities of 12 %, 55 % and 75 % for extended periods of time. The samples were monitored for changes both in their visual appearance, mass and chemical composition. Chemical analysis was carried out using micro FT-IR spectrometry and ion chromatography. The changes in the molar mass distribution were studied using gel permeation chromatography. Naturally aged samples have also been studied to help validate the accelerated ageing studies.

Plastics have had an increasing influence on human activity since the early years of the 20th century and as such are becoming an increasingly important part of
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