International Journal of Engineering and Information Systems (IJEAIS)
ISSN: 2643-640X
Vol. 4, Issue 4, April – 2020, Pages: 27-28

Adhesive Strength of Polyvinylchloride Plates

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Abstract: *In this study Polyvinyacetate, PVAC was used as adhesive material to join two overlapped plattes of Polyvinylechloride PVC. Different parameters were studied in details. The strength of the samples joints was tested in shear by using a 2kN MTS tensile machine equipped with a video-extensometer.*

Keywords: Adhesives, PVC, Polyvinyacetate, Shear stress, Roughness, THF.

Introduction

An adhesive may be defined as a material which when applied to surfaces of material can join them together and resist separation. As a mean of joining materials adhesives have been used by mankind for many centuries. However, it is only in the last 60 years that the science and technology of adhesion and adhesives has really progressed. The main reason for this is that the adhesives employed in nearly all the technically demanding applications are based upon synthetic polymers [1-5]. Such materials possess the balance of properties that enables them to adhere readily to other materials and to have an adequate strength so that they are capable of transmitting the applied loads or forces from one substrate to the other.

Adhesives are used to locate one adherend relative to another in such a way that a load can be transmitted from one member to the other. Besides being strong enough, the joint must be sufficiently durable to resist the environmental stresses to which it is subjected during its life time. For a given glue-adherend system, its strength depends on, the way in which stresses develop around the joint, the cleanliness and smoothness of the adherend surfaces, and the way in which the glue wet them [6-8].

Experimental section

Materials and preparation

Polyvinylacetate was used in this study as adhesive material to join parallel plates of PVC. The dimensions of the PVC plates were 50x5x2 mm and the plates were overlapped in a distance of 20 mm except same samples had 40 mm lap joints length. Polyvinylacetate was prepared as a semi liquid in tetrahydrofuran solvent at 60°C for about 1 hour. Followed by placing a thin film of the adhesives as sandwich in between plate-plate PVC at a surface area of 20x5 mm of the plates. Then the samples are positioned in the press mould at temperatures, pressures and times were different from one another. Some samples were prepared by the addition of textile fiber and sand to the adhesive in around 5% by weight.

Results and Discussions

The results of shear test are recorded from the instrument in table as applied load in N, elongation in mm and time in sec. The load was plotted against elongation and time in Figures 1 and 2 respectively. The maximum applied load until the lap joint breaks, is taken from the maximum peak in Figure 1 and the energy required to break (failure energy) the joints are calculated from the area under the curve in Figure 1. The maximum load and the failure energy are taken in this study to represent the strength of the lap joints of the samples. All the results of the samples with lap joints length more than 20 mm were inaccurate because sometimes the strength of the joints was more than that either one plate (strip) of PVC or both of the two plates, therefore these data are excluded in this work. The preparation conditions for the samples are indicated in each figure. The effects of the variation in the preparation conditions on the strength of the lap joints of the samples are studied and compared as the following:

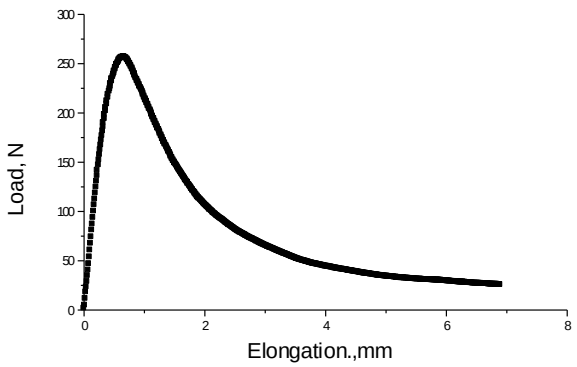

Figure 1:Apllied load versus elongation

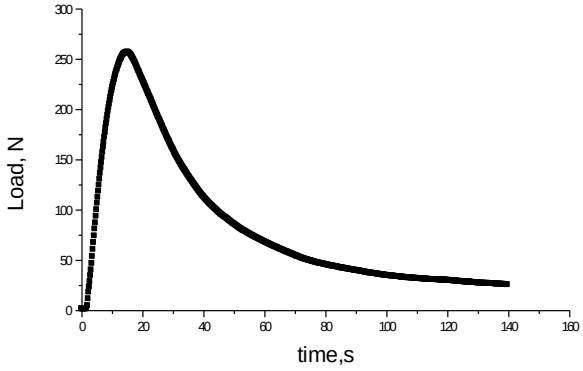

Figure 2:The failure time of the joints at room temp.

Conclusion

Overlapped plattes of PVC were joined in this study by using Polyvinyacetate and THF over 20 mm distance. The paramters of the preparation conditions were studied. The strength of the lap joints of the samples were tested in shear by using a 2kN MTS tensile machine equipped with a video-extensometer.

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