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Durability of polymeric pipes in contact with domestic products

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Abstract

Polymers are used more and more to make pipes for conduction of water in buildings. There are a lot of advantages in the use of polymers, e.g. flexibility, lightness and lower costs. The polymeric pipes selected for this study were PVC and PE. During a 1-year period they were submitted to various types of conditioning. We used water with some domestic products. The quantity used was three-times more than that indicated for the producer. With this quantity we accelerated the tests of durability. Every three months we observed the pieces of polymers, measured their thickness and weighed them. After a year everything was okay relating to the aspect, thickness and weight. To verify in what measure the mechanical proprieties were affected, we submitted the pieces to tensile tests. The results show that domestic products do not affect the tensile resistance of the polymers.

Keywords: Durability; Polymeric pipes; Domestic products

1. Introduction

The conduction of water in buildings is increasingly carried by polymeric pipes. These materials have some advantages compared with other materials, such as metallics or ceramics. The advantages are flexibility, lightness and lower costs.

The durability of polymers is usually affected by temperature, solar radiation, oxygen, wind and humidity [1–3]. The influence of domestic products used in washing, is not well known. Therefore we decided to study the durability of polymeric pipes in contact with some domestic products.

The durability of polymers used to make geotextiles has been studied [4]. Their durability in contact with domestic products is different and is not well studied. We did not find a lot of references related with this subject [5].

To do our study, we used two kinds of polymers, PVC and PE. The sections of pipes were immersed in water with the domestic products. In order to accelerate the degradation we added triple the quantity of domestic products of that recommended by the producer. For products used in clothes-washing-machines, this quantity is calculated taking it that they are dissolved in 15 l of water. For dish-washing-machines the calculation is made taking it that they are dissolved in 5 l of water.

2. Tests

The pipes used have the following diameters:

Specimen 1	PVC	75 mm
Specimen 2	PVC	50 mm
Specimen 3	PE	50 mm
Specimen 4	PE	105 mm

The polymers were put in contact with some domestic products. We had five conditioning ambients:

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A. at the laboratory atmosphere;
B. water with lixivium (22 ml/l);
C. water with detergent for ware manual (13 ml/l);
D. water with detergent for clothing machines (35 ml/l); and
E. water with detergent for ware machines (10 ml/l).

The complete immersion was 1 year. Every three months we measured the thickness and determined the weight of the polymers. During these determinations we did not find anything irregular.

After the one year of immersion we decided to do tensile tests based on the ASTM D638. All the tests were made at 23°C and 50% humidity. The grip distance was 25 mm. Six specimens of each polymer and diameter were tested.

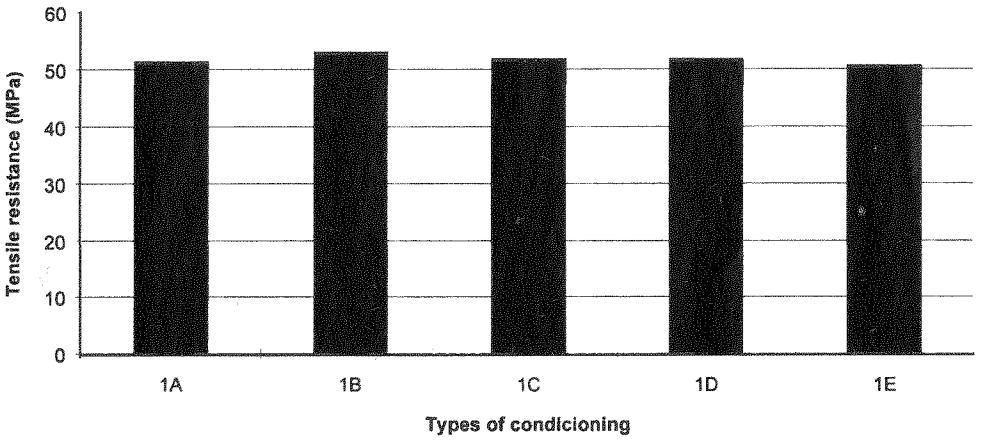

Fig. 1. Variation of tensile resistance with different types of conditioning for PVC—75 mm.

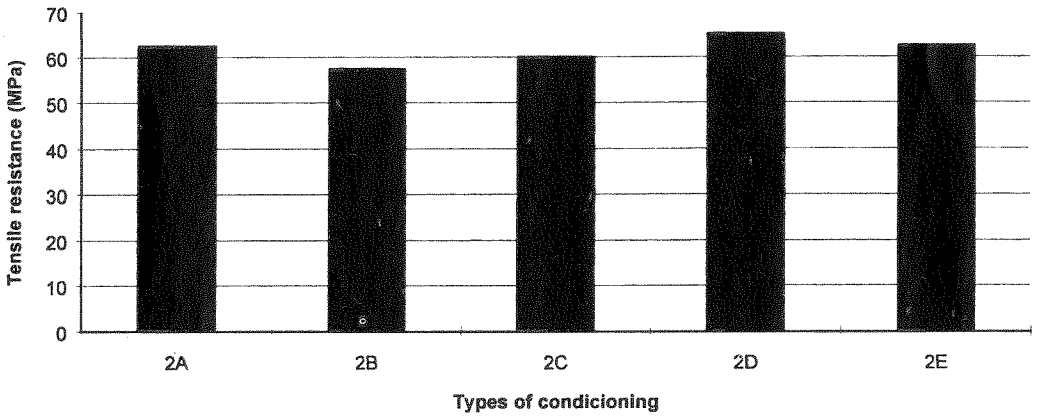

Fig. 2. Variation of tensile resistance with types of conditioning for PVC—50 mm.

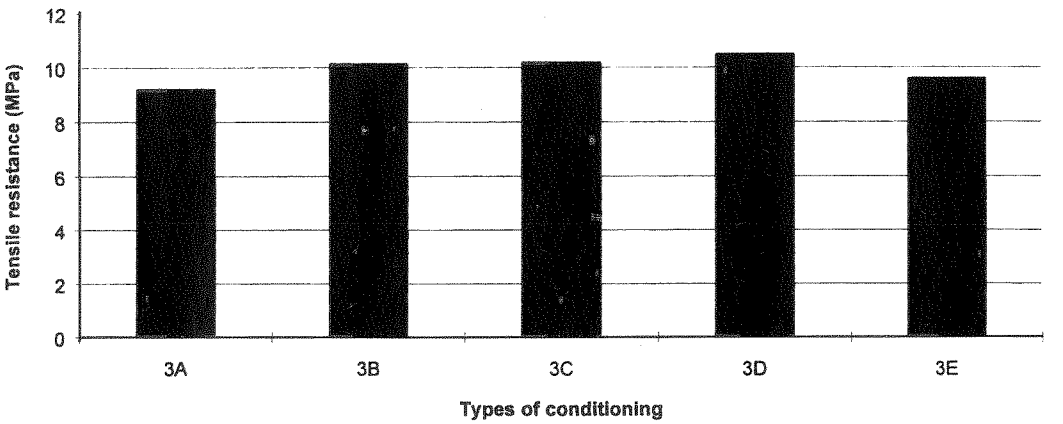

Fig. 3. Variation of tensile resistance with types of conditioning for PE—50 mm.

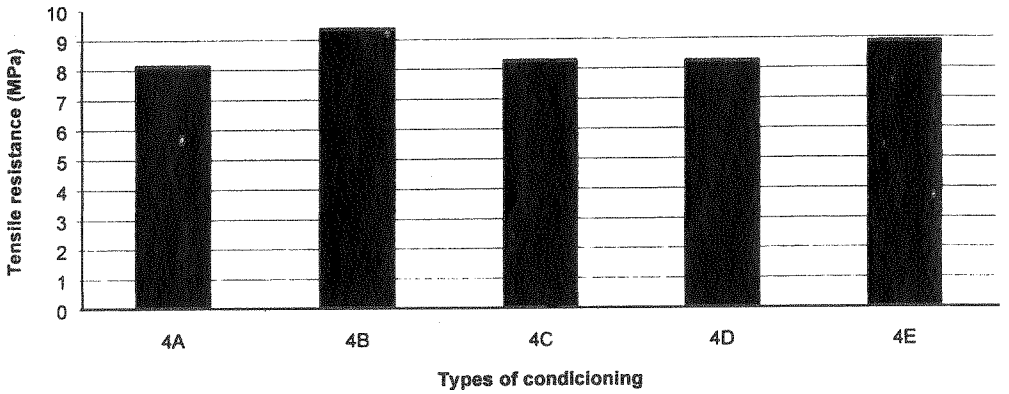

Fig. 4. Variation of tensile resistance with types of conditioning for PE—105 mm.

3. Results and discussion

The results of tensile resistance tests are presented on Figs. 1–4. As we can see, the polymers were not affected with the domestic products used for conditioning during one year. The tensile resistances do not change very much when we compare the conditioning at the laboratory atmosphere with the others types of conditioning with domestic products.

4. Conclusions

We put two types of polymeric pipes in contact with solutions containing domestic products used to wash clothes or ware. They were completely immersed for one year. Every three months we measured the thickness and determined the weight of the pieces of polymer. We did not find anything irregular.

To see if the conditioning affected tensile resistance we did some tests. We did not find significant decreases of tensile resistance for any polymer (PVC or PE) used. So, we can conclude that the durability is good. The domestic products used did not affect the polymeric pipes.

Acknowledgement

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