

STUDY ON THE AGEING EFFECT ON THE FLEXIBLE POLYETHYLENE PIPE IMMERSSED IN WATER ALL THE TIME Part II

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Ageing effect on flexible polyethylene pipe permanently immersed in water all the time was studied for a period of five years. It was observed that even after five years no noticeable change was observed in the flexibility of the pipe. The carbonyl group appeared very slowly which clearly indicates that the rate of oxidation process has decreased as compared with open atmosphere. Different sources of water affect the pipe differently.

INTRODUCTION

The degradation of polymers due to temperature [15], oxygen and ultraviolet lights [5, 6] is a common phenomenon in polymers. Different types of coatings [12], stabilizer [7] antioxidants [9, 10], and UV stabilizers [11] are used to prevent this process of degradation in polymers. Different technique have been used to decrease the degradation of polyethylene [8, 12]. Once degradation has started, it is not possible to stop this reaction. Due to the autocatalytic nature of the reaction, the rate of oxidation increase as the amount of oxygen absorbed increases. It has also been reported that some microorganism [4] also play a part in the degradation of polymer. It has also been noticed that climatic temperature also plays a predominant role in the degradation of polyethylene [15]. The oxidation rate increases with the increase of atmospheric temperature. It has also been observed that uncoated polyethylene used for dampproof concrete becomes brittle after 2-3 years and the processes of oxidation is very fast [16]. It has also been reported that in accelerated outdoor exposure tests, the extent of carbonyl group formation in polyethylene film depends geatly on test sites [17].

APPARATUS AND PROCEDURE

Polyethylene Flexible Pipe. The flexible pipe of polyethylene specially made into a water-pipe was purchased from the market.

PROCEDURE

The sample of flexible polyethylene pipe was taken and was characterized by I.R. technique. The flexible pipe was kept under running water all the time. The sample of

the tube was taken annually and characterized by I.R. technique. The measure of the carbonyl peak which emerged was taken every year and its flexibility was studied. Conclusions were drawn after a study spread over five years.

RESULTS

The carbonyl group in the polyethylene spectrum emerged (Fig. 1) at λ max. 1760 slowly after a year. This group increased with time as show in Fig. 2.

DISCUSSION

The above results clearly indicate that the rate of oxidation or the carbonyl group formation is much less as compared with open atmosphere. It may be due to the lesser availability of active oxygen [4, 5] in the water. In other

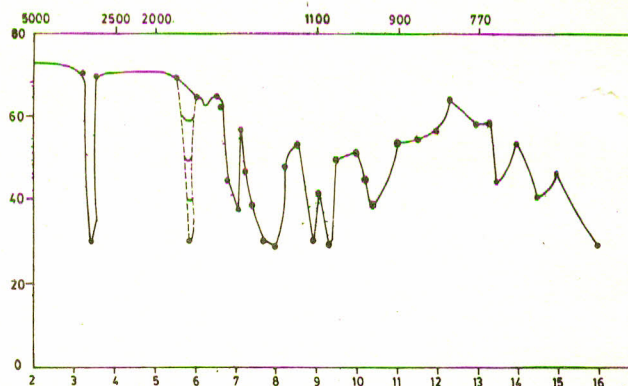


Fig. 1. Increase in carbonyl peak at λ max. 1760 with time (years).

words the percentage of oxygen in water is far less as compared with open atmosphere [3]. The rate of oxidation is

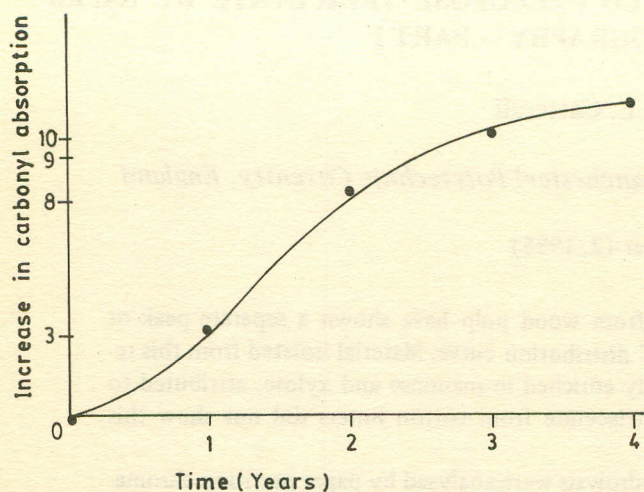


Fig 2. Increase in carbonyl peak/time.

more in canal and river waters as compared with waterworks supply. It may be due to the presence of salts [17] which can act as a catalysts or help in increasing the rate of oxidation. It clearly indicates that the hardness and softness of the water also play a role in the degradation of the polymer.

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