

Experimental study of chemically aged HDPE pipe material in toluene-methanol mixture and distilled water

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Abstract: Studying the aging phenomenon of plastic pipes presents simultaneously an economic achievement and a technical challenge for water and natural gas transportation systems. Very often, they are exposed to aggressive environmental agents such as UV rays, ambient oxygen, acids, bases and some other so lvents, altering the material microstructure, its physical and chemical properties. The high density polyethylene (HDPE) material degradation and loss of performance are usually the consequence of unwanted changes in mechanical behaviors leading to lower resistance. In this s tudy, we examine the effects of distilled water (DW) and a mixture of toluene-methanol (TM) in contact with an HDPE pipe. Morphological properties such as crystallinity and oxidation induction time (OIT) are in vestigated using DSC method. Tensile tests and thermal analysis show that the TM mixture is much more absorbed by the resin as compared to DW. An increase in crystallinity is observed as established from literature for other organic solutions. Finally, the study gives an idea about property variances and their evolution as a function of the pipe thickness which c an be used as an estimation of the structural heterogeneity of the product.

Keywords : Pipe; HDPE; Aging; Distilled Water; Toluene-Methanol Mixture; Crystallinity; OIT