Nanostructuring of different types of polyethylene in their compatible welded joints

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Today, polyethylene products occupy one of the main parts in industrial and commercial markets. The problem of unresearched welding of different types of polyethylene is exacerbated primarily because of the difficulty of the repair of pipelines made of polyethylene PE-63 and PE-80 with polyethylene grade PE 100, by back to back method. The difficulties caused by different typical modes of welding and different structure corresponding emergence of a number of internal defects such as no welding in some areas, pores in the weld.

TGA studies revealed that in the area before fusion, weld has higher stability and less weight loss, according to the pure polyethylene. This indicates that in the weld seam are forming structures with higher thermal stability. This situation is also confirmed with TMA researches on which it can be assumed that welding of different types of PE, areas with higher thermal stability and areas with internal tension are forming in the welding zone. Curves of DSC, showed increased fusion temperature of weld joint compared with the corresponding fusion temperature of both pure types of polyethylene. It is an confirmation of the assumption that in the weld seam forming zones with a higher thermal stability, and crystallites with higher degree of order. Other arguments that confirm our assumption is WAXS analysis of samples of PE-80, PE-100 and PE80/PE 100 weld shows that they have amorphous-crystalline structure (represented diffraction peaks at angles of dispersion $2\theta max$=21.2, 23.6, 29.7 and 36.7). It was established that during the welding process taking place the restructuring of crystalline phases and forming crystalline areas with higher mechanical and thermal properties, due to the increasing number of crystallites to bigger and better arrangement.