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Innovative method of polyethylene – polypropylene welding under the effect of strong constant magnetic field

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Regardless wide practical application, and deep thermoplastics' welding technologies investigations, there is still a lack of fundamental investigations of structure and thermal properties of welded joints, as well as of their effect on the operation properties.

Currently there is a problem of welding of hard-to-weld couples of thermoplastics, like polyethylene and polypropylene. Such welds have low operation properties.

This paper presents results of structural and thermal investigations of hot tool butt welds of polyethylene (PE-80) with polypropylene (PP-80), received under effect of magnetic field (B~1 Tl), and without such effect. Operation properties of such welds have also been investigated.

Using WAXS and SAXS methods it was founded that constant magnetic field effect on the melt of polymers (i.e. on the polymers in viscous-flow status, where the structure elements have the maximum mobility) causes formation of oriented welded joint structure with the axle coincides with the magnetic field effect direction. This effect causes improvement of operation properties of the welds due to the orientation of magnet-anisotropic macromolecules and aggregates in the polymer melts.

Basing on the mechanical tests results it was founded that tensile strength of PE-80/PP-80 joint welded under the effect of constant magnetic field (acting transversally to the welding axle) is 12 MPa, and of welded without magnetic field effect is 6 MPa.