

Physico-Chemical nanomaterials science

Nanoscale effects in the welded joints of plastics

M.V.Iurzhenko^{1,2}, V.L.Demchenko^{1,2}

¹ *Plastics Welding Department, E.O.Paton Electric Welding Institute, National Academy of Sciences of Ukraine, B.8, 11, Kazymyra Malevycha str., 03680, Kyiv, Ukraine*

Email: iurzhenko@paton.kiev.ua

² *Institute of Macromolecular Chemistry, National Academy of Sciences of Ukraine, 48 Kharkivske Av., 02160, Kiev, Ukraine*

All welding methods have their own technological peculiarities and typical defects of welded joints. In spite of the numerous developed technologies and wide welding practical application the detailed research of polymers (including polyethylene) welding nature is still not completed; mechanism of welds' formation is not explored sufficiently. Investigations of morphology, as a rule, enable to study the PE macrostructure, fusion lines and heat-affected zone geometry. In some works the PE macromolecular structure affecting on material weldability has been investigated as well as the internal deformations in PE welded joints, but general mechanism of welded joint formation and macromolecular structures in the weld are still studied insufficiently.

Hereby, there is still no complete understanding of PE and other polymers welded joints formation and structural peculiarities. Welding process of more complicated chemical system than polyethylene is even less explored. In this work the results of complex investigations (by means of differential scanning calorimetry, thermogravimetric and thermomechanical analysis, as well as via wide-angle X-ray scattering) of technical PE types welds structure and their properties are presented. Basing on analysis of the results obtained some new hypothesis concerning nature and mechanism of welds' formation and polymer structuring in such welds are proposed.