This abstract is intended for (double click the selected box and then check):

Oral presentation ☒
Poster presentation ☐
Invited lecture ☐

STUDY OF WELDING STRENGH IN PVC PROFILES

C.I. Martins[1]*, F.A. Lima, F.M. Duarte[2]

Institute for Polymers and Composites/I3N, University of Minho, 4800-058 Guimarães, Portugal
[1]*cmartins@dep.uminho.pt;* [2]*fduarte@dep.uminho.pt*

Polyvinyl chloride, PVC, is one of the most widely produced and used plastic, being commonly used in civil industry due to its wide range of mechanical properties (from rigid to flexible), low cost, durability, and easy to assemble. Due to its good mechanical and thermal properties, PVC can be used to produce window and door frames, protecting the interior from the external actions, such as noise and temperature gradients. In order to achieve the final dimensions and geometry, previously extruded profiles must be cut and assembled, being the butt welding one of the most efficient techniques. This plastic welding method involves three main steps: i) pressing the parts to be joined against either side of a heated plate; ii) removing the plate when the parts are sufficiently molten and iii) pressing the components together and holding them until they are cooled. The amount of molten material, generated during the heating stage at an adequate heating time and the plate temperature, as well as the amount of material forced out from the joint during the pressing stage (joining displacement), have major influence in the final welding properties. Although the lack of information about the butt welding of PVC, previous studies with for others materials [1-3] showed that the welding strength can be optimized changing the plate temperature and/or joining displacement.

The aim of this work was to study the influence of the plate temperature and the heating time in the welding strength of PVC profiles used in windows frames. The profiles were welded in an industrial butt welder machine, setting the plate temperature at 245ºC, 260ºC and 275ºC and the heating time at 15 and 20s. The mechanical properties were evaluated by mechanical bending tests, according to UNE-EN 514 standard and the welding strength was correlated with the morphology of the welded parts observed by optical microscopy. The results are showing that the increase of plate temperature and heating time increase the welding strength. However, the presence of impurities in the joint, such as trapped air or degraded material, as well as the joint alignment, can have a detrimental effect on the welding strength, as observed by the morphological analyses.

1.Stokes, V.K., Experiments on the hot-tool welding of three dissimilar thermoplastics. Polymer, 1998. 39(12): p. 2469-2477.

2.Stokes, V.K. and K.R. Conway, A phenomenological study of the hot-tool welding of thermoplastics. 4. Weld strength data for several blends. Polymer, 2001. 42: p. 7477-7493.

3.Oliveira, M.J., C.A. Bernardo, and D.A. Hemslev, Morphology and Mechanical Behavior of Polypropylene Hot Plate Welds. Polymer engineering and science, 2001. 41(11): p. 1913-1922.

Acknowledgement: The authors would like to acknowledge the company CAIXIAVE SA for their collaboration in the present work

Keywords: Butt welding; Extruded profiles; PVC; Morphology