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Performance of a structural acrylic adhesive for linear glass-metal connections under shear and tensile loading

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Abstract

Glass-metal elements with composite action based on linear adhesive connections show a high potential in terms of structural efficiency. The adhesives considered for such applications need to fulfil a wide range of requirements and generally exhibit a non-linear material behaviour. This is also the case of the two-component structural acrylic adhesive investigated in this article. For this adhesive an experimental programme is carried out to assess its structural performance and its adhesion to selected metal and glass surfaces. Furthermore, the influence of different joint dimensions on the stress-strain properties of the adhesive in glass-metal connections, under shear and tensile loading, is analysed. The best results in terms of adhesion are obtained on stainless steel surfaces grinded with an abrasive paper P150 and on the tin side of float glass, respectively. To predict the mechanical behaviour of such connections, the suitability of material models covering both classic and porous plasticity is studied by means of non-linear finite element simulations. A novel surface fitting equation is introduced to obtain stress-strain data at constant true strain rates from uniaxial tensile test results performed at constant displacement rates. A good agreement between experimental and numerical results for shear loading is

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