



Adhesive Acrylate Metal-Glass Connections: Influence of Temperature and Thickness of Adhesive Layer

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Abstract

Adhesive connections are used mainly in the automotive and aerospace industry. Their considerable number of benefits and requirements given by architects and designers lead to using adhesives in civil engineering not only for a non-loadbearing structures but also for more complicated structures such as a cladding of the facades or load-bearing structures. However, a lack of knowledge prevents their wider use. The paper is focused on experimental testing of Zn-electroplated steel - glass and aluminium - glass connections under shear stress using two-component acrylate adhesive. The influence of the adhesive layer (1 mm and 3 mm) and elevated temperature (60 °C and 80 °C) on mechanical properties is investigated. Specimens with 3 mm adhesive layer thickness reached higher shear strength in comparison with specimens with 1 mm layer thickness. Shear strength (up to 30% of maximum shear strength) and stiffness decrease with elevated temperature. Good adhesion of the adhesive to glass and metal was demonstrated at room temperature. Glass adhesion failure was observed at temperature of 80 °C.

Keywords: glass; metal; adhesives; elevated temperature; layer thickness; shear strength.

1 Introduction

The first impression of the building is the facade. Whether used in old or new building, the design of the facade ensures its uniqueness. In modern buildings, glass is increasingly used not only as a window filling but also as a load-bearing element. Various types of cladding are also used, including the use of steel and aluminium. Architects compete in designing more interesting facade surfaces, which require more challenging ways of their connections to the supporting structure. Traditionally used mechanical joints are not always able to meet the requirements. There is an increasing demand for adhesive joints, which have so far been used mainly in the automotive or aerospace industry. There are also adhesive joints used in civil engineering. These joints are not

frequently used for load-bearing structures. There are more demanding ways of fixing heavy façade elements, which require the use of stiffer and stronger adhesives than the traditionally used silicone.

Many institutions investigate the use of adhesives in facades [1], [2], the influence of the wind load on adhesive connection [3], adhesive tapes and their durability [4], and there are also some projects with high-performance building skins, etc. [5]. Facade reconstructions are also possible with the use of adhesives [6]. Although there are many studies on adhesives in civil engineering, there is still lack of knowledge about their mechanical properties, especially in task of their behaviour at elevated temperature, exposition to weather conditions, long-term load, etc.