www.elsevier.com/locate/ijadhadh

Water-based adhesive formulations for rubber to metal bonding developed by statistical design of experiments

Juliana Lasprilla-Botero, Mónica Álvarez-Láinez, Diego A. Acosta

PII: S0143-7496(16)30225-1
DOI: http://dx.doi.org/10.1016/j.ijadhadh.2016.11.007
Reference: JAAD1927

To appear in: *International Journal of Adhesion and Adhesives*
Accepted date: 14 November 2016

Cite this article as: Juliana Lasprilla-Botero, Mónica Álvarez-Láinez and Dieg A. Acosta, Water-based adhesive formulations for rubber to metal bonding developed by statistical design of experiments, *International Journal of Adhesio and Adhesives,* http://dx.doi.org/10.1016/j.ijadhadh.2016.11.007

Water-based adhesive formulations for rubber to metal bonding developed by statistical design of experiments

Juliana Lasprilla-Botero[a], Mónica Álvarez-Láinez[a*], Diego A. Acosta[b]

[a] Grupo de Investigación en Ingeniería de Diseño (GRID), Product Design Engineering Department, Universidad EAFIT, Carrera 49 No 7sur-50, Medellín, Colombia (South America)

[b] Grupo de Desarrollo y Diseño de Procesos, Process Engineering Department, Universidad EAFIT, Carrera 49 No 7sur-50, Medellín, Colombia (South America)

Abstract

Waterborne adhesives for rubber to metal bonding have been available since 1990. However, published information about their formulation has been limited, as proprietary restrictions are exercised by companies. As a consequence, the way these adhesives interact with substrates has not been studied extensively. With the aim of investigating the effect the components of a waterborne adhesive have on rubber to metal bonding, fractional factorial and surface response methodologies of design of experiments were employed in this study. Twenty six formulations were prepared with a polychloroprene latex as the adhesive polymer. Viscosity, wettability and non-volatile solids content were measured with each liquid adhesive, while the mechanical strength was evaluated by applying a tensile mechanical stress over cured solid adhesive films. Adhesion properties were evaluated by using a single lap-shear test on metal to metal joints and a pull-out test on rubber to metal joints. The results showed that the components with the largest relative influence on cohesive and adhesives forces were tackifier resin, silicon dioxide and polychloroprene latex type. In order to better understand the contributions of these variables, mathematical models correlating them with the response variables were obtained. This study is valuable in explaining how, through statistical methods, a waterborne adhesive for rubber to metal bonding can be formulated with a reasonably low number of experiments.

Keywords: A. water based, B. metals, B. rubbers, design of experiments

Corresponding author

Email addresses: jlaspril@eafit.edu.co (Juliana Lasprilla-Botero), malvar26@eafit.edu.co (Mónica Álvarez-Láinez), dacostam@eafit.edu.co (Diego A. Acosta)