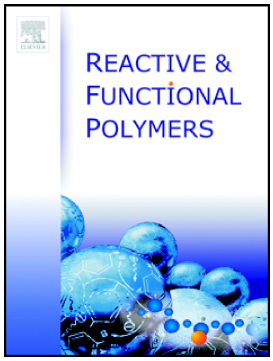

Understanding the curing kinetics and rheological behaviour of a new benzoxazine resin for carbon fibre composites

V. García-Martínez, M.R. Gude, A. Ureña

PII: S1381-5148(17)30026-3
DOI: doi: 10.1016/j.reactfunctpolym.2017.02.005
Reference: REACT 3803

To appear in: *Reactive and Functional Polymers*

Received date: 26 September 2016
Revised date: 9 February 2017
Accepted date: 10 February 2017

Please cite this article as: V. García-Martínez, M.R. Gude, A. Ureña , Understanding the curing kinetics and rheological behaviour of a new benzoxazine resin for carbon fibre composites. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. React(2017), doi: 10.1016/j.reactfunctpolym.2017.02.005

UNDERSTANDING THE CURING KINETICS AND RHEOLOGICAL BEHAVIOUR OF A NEW BENZOXAZINE RESIN FOR CARBON FIBRE COMPOSITES

V.García-Martínez[a,b], M.R.Gude[a], A.Ureña[b]

[a]FIDAMC, Foundation for the Research, Development and Application of Composite Materials, Avda. Rita Levi-Montalcini 29, 28906 Getafe, Madrid, Spain

[b]Department of Applied Mathematics, Materials Science and Engineering and Electronics Technology, Universidad Rey Juan Carlos, 28933 Móstoles, Madrid, Spain

Corresponding author: FIDAMC, Avda. Rita Levi-Montalcini 29, 28906 Getafe, Madrid, Spain. Tel.: +34 914433113. Email: Vanessa.Garcia.External@fidamc.es, Web page: http://www.fidamc.es

ABSTRACT

The curing kinetics and viscoelastic properties of a benzoxazine resin intended for liquid resin infusion and resin transfer moulding processes was investigated by differential scanning calorimetry (DSC) and rheological experiments. An autocatalytic kinetic model was proposed and all kinetic parameters including reactions orders and activation energy were determined. The curing kinetic equation obtained by linear model-fitting of non-isothermal experiments matched reasonably well with the experimental results from both non-isothermal and isothermal tests. The evolution of viscoelastic properties, such as storage modulus (G'), loss modulus (G'') and complex viscosity (Iηl*) was recorded during the curing reaction. Gelation times at several isothermal temperatures between 170 and 210 ºC were obtained and the activation energies for curing and gelation were calculated. Finally, quasi-isothermal DSC experiments were carried out in order to obtain the vitrification times, using the inflexion point of the reversing heat capacity ($C_{p\text{-}rev}$).

Keywords: benzoxazine, liquid resin infusion processes, curing kinetic, vitrification, gelation.