



## Rheological behaviour of core-shell emulsion/ amine crosslinking process

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### Abstract

Isothermal kinetics studies of thermal-induced gelation for epoxy functionalized poly (vinyl acetate) emulsion and diamine were investigated rheologically. The change in the viscoelastic material functions such as elastic storage modulus,  $G'$ , viscous loss modulus,  $G''$  and complex dynamic viscosity,  $\eta^*$  during the gelation process was evaluated. The isothermal gelation kinetics was also analyzed using an isoconversional method that was based on replicated experimental data and model-free kinetics calculations. This isoconversional method evaluated effective activation energy.

**Key words:** *Rheology, Crosslinking, Emulsion, Vinyl acetate, Glycidyl methacrylate, Diamine*

### 1. Introduction

Poly (vinyl acetate) emulsion represents one of the most important binder materials because of its relatively low cost, low toxicity, ready availability, wide compatibility and excellent adhesion to cellulosed materials. However, the main deficiencies of the adhesive are the poor water, creep and heat resistances, deformation under load over time due to the inherent and thermoplastic nature. In order to circumvent these problems, epoxy functional groups that provide sites for post-crosslinking have been introduced in the polyvinyl acetate latex by emulsion polymerization. It is very important to control rheological behaviour of post-curing process (Madbouly *et al.*, 2005a, Madbouly *et al.*, 2005b). The rheological behaviour of a system of crosslinkable PVAc emulsion

and amine was studied as functions of time. The effects of the gelation process of the system on of the viscoelastic material functions, elastic storage modulus  $G'$ , loss modulus  $G''$  and complex viscosity  $\eta^*$  were investigated.

### 2. Experimental

#### 2.1. Materials

Monomers: vinyl acetate (VAc), glycidyl methacrylate(GMA), and VeoVa10. All other reagents were used as received, namely the initiators ammonium peroxydisulfate (APS) (Aldrich), and benzoyl peroxide (BPO) (BDH); chain transfer agent 1-dodecanethiol (DDM) (Aldrich); surfactants sodium dodecylbenzene sulphate (SDBS) and Triton X100; buffer sodium hydrogen carbonate; reducing agent sodium metabisulfite; curing agent ethylene diamine (Aldrich).