

Abstract Submitted
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The First Normal Stress Difference in Waterborne Paints Thickened by Hydrophobically Ethoxylated Urethane (HEUR) Rheology Modifier: A Simplified Phase Diagram TIRTHA CHATTERJEE, ANTONY VAN DYK, VALERIY GINZBURG, ALAN NAKATANI, Dow Chemical Co — Since their invention in the 1970s, hydrophobically ethoxylated urethane (HEUR) associative thickeners are widely used to modify the rheology of waterborne paints. While their flow curves (viscosity vs. shear rate) and microstructure have been studied extensively in recent years (1-4), there is surprisingly little information on the paint normal stress under application conditions. However, understanding of normal stress behavior is critical for many applications such as brush drag and spatter. In this work we will demonstrate that in HEUR-based paints the first normal stress difference (N1) is controlled by two factors: (a) adsorption of HEUR molecules on latex particles and (b) ability of non-adsorbed HEUR to form transient bridges between particles with HEUR shells. By controlling these two effects, one can design a paint formulation with targeted N1 behavior (positive or negative N1 under high shear). Finally, a simplified phase diagram will be presented connecting formulation composition-microstructure- and N1 behavior. The results would serve as guidelines to formulate paints to meet the specific customer needs. 1. Beshah, K., et. al.; 2013, *Macromolecules*, 46(6), 2216. 2. Chatterjee, T., et. al.; 2014, *Macromolecules*, 47(3), 1155. 3. Van Dyk, A.K., et. al.; 2015, *Macromolecules*, 48(6), 1866. 4. Ginzburg, V.V., et. al.; 2015, *Macromolecules*, 48(21), 8045.

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