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EFFECT OF CROSSLINK DISTRIBUTION ON DEFORMATION AND ADHESIVE PROPERTIES OF WATERBORNE CORE-SHELL PSA

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From a practical standpoint, soft adhesive films with a nanostructure obtained from a core-shell morphology of the particles tend to display a better compromise between adhesive and cohesive properties although the reason for it is poorly understood. We developed a model system where the peel force during debonding was mainly controlled by the core structure whereas the cohesion of the film was controlled by the crosslinking density of the network. These crosslinking points are formed through the reaction of diacetone diacrylamide (DAAM), incorporated as a comonomer in the shells of the particles only, and adipic acid hydrazide (ADH), added in the water phase in stoichiometric proportions. We investigated a model system with variable core/shell volume fractions to clarify the respective role played by the core, the shell and the cross-link distribution in adhesion, cohesion and large strain extension. The monomer compositions of the core and the shell were identical and the controllable parameters were the following: the cross-link density in the shell, and the core/shell volume ratio (the particle size is kept constant). Then a constant total amount of crosslinking monomer was distributed homogeneously in shells of different thicknesses.

Mechanical properties of these films were characterized by tensile tests at various velocities, rheology experiments (in the small deformation range), and probe tack measurements. Because the total amount of added crosslinking points and the particle size were kept constant, for all latexes in the series, the particle structure varied from a densely crosslinked thin shell to a sparsely crosslinked thick shell, with a viscoelastic core in all cases. Systematic results will be presented and a microscopic model accounting for the change in adhesive properties with particle structure will be presented.