PRESSURE SENSITIVE ADHESIVES PRODUCED BY IN-SITU EMULSION POLYMERIZATION OF CELLULOSE NANOCRYSTAL-POLY(n-BA-VAc)

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Pressure sensitive adhesives (PSAs) are conventionally produced using a variety of polymerization methods such as emulsion, solution, or radiation curing. Environmental concerns favor the development of emulsion polymerization based PSAs.[1] However, maintaining and controlling the PSA properties achievable from solution polymerization in PSAs produced by emulsion polymerization remains challenging. Depending on the particular adhesive application, PSA properties are largely guided by the polymer glass transition temperature and the polymer microstructure. The latter is controlled in a variety of ways but typically via the addition of chain transfer agents and crosslinkers.[2] During the last decades, efforts in PSA property manipulation have included the preparation of nanocomposite latexes by introducing nanomaterials such as titanium dioxide, silica, and carbon nanotubes into the formulations.[3]

On the other hand, utilizing cellulose nanocrystals (CNCs) as a sustainable source of reinforcement in polymers is emerging rapidly.[4] CNCs are the product of controlled hydrolysis of plant based tissues, through which crystalline domains of cellulose are isolated from the disordered parts of the raw material. High aspect ratio, surface activity and modulus, as well as non-toxic nature of CNCs make them ideal candidates for use in nanocomposite formulations. More recently, our group have prepared CNC nanocomposite PSAs which were revealed to significantly and *simultaneously* improve tack, peel strength and shear strength in the PSA films.[5] The ability to improve tack and peel strength without decreasing shear strength overcomes a major challenge in PSA formulation.

We will present results from emulsion polymerization of n-butyl acrylate/vinyl acetate/CNC nanocomposite PSAs. We will identify the location of the CNCs relative to the latex particles and show their effect on latex viscosity, gel content, and PSA properties. The goal of these new results is to show how the manipulation of the reaction formulation (e.g., monomer feed ratio, surfactant type) will affect the distribution and relative location of the CNCs in the polymer latex and ultimately the PSA properties.

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