**Vanadium chemistry for improving mechanical properties and stability in polysaccharide-based materials**

Polysaccharide- based materials are a good replacement for plastics, due to their biodegradability, low toxicity, and low cost. However, their use is limited due to the difficulty in achieving materials with robust mechanical properties and the high hydrophilicity which causes performance to degrade in humid environments. To overcome these hurdles, cross-linkers such as citric acid, nanoparticles and fibers can be added, or different polysaccharides can be blended to make composite materials. Our approach was to use vanadium ion coordination to obtain materials with enhanced mechanical properties and stability. We made films using pectin and chitosan and added glycerol as a plasticizer and V(V) ions as the crosslinker. FT-IR spectra proved the formation of a hydrogen bonding network as well as electrostatic interactions between the different components of the films. Electron micrographs showed laminated sheets with a lamellar distance of ~0.16 µm for vanadium-coordinated films compared to a much larger distance of ~ 0.75 µm for vanadium free films. Moreover, thermal gravimetric analysis (TGA) and dynamic mechanical analysis (DMA) showed that addition of vanadium ions to the polysaccharide films improved their mechanical properties (modulus and elasticity) and water and thermal stability. More interestingly, blue light irradiation turned the yellow films to green then blue which is correlated to reduction of V(V) to V(IV). Note that no significant changes in microstructure of films were observed upon light irradiation, although some small changes in modulus were observed in real time with light irradiation. In conclusion, strong metal-coordination interactions can be used to create tough, water-stable and photoresponsive polysaccharides-based materials.