

## **Lipid modification of carbohydrates – Novel surfactants, emulsifiers, antioxidants and hydrogelators.**

Manfred P. Schneider and Sukhendu Nandi,  
Bergische Universitaet Wuppertal, Wuppertal, Germany  
[schneid@uni-wuppertal.de](mailto:schneid@uni-wuppertal.de)

Agricultural crops provide a considerable reservoir of useful and low cost raw materials such as fats, oils, proteins and carbohydrates. By selective combination of their molecular constituents a wide variety of materials with interesting properties can be prepared, all of them - due to their molecular constitution - being potentially highly biodegradable. We recently discovered that hydroxy carboxylic acids such as citric-, malic- and tartaric acids can be converted in one step and quantitatively into the corresponding O-acylated anhydrides, excellent electrophiles for ring opening reactions with various carbohydrates such as monosacharides (D-glucose, D-glucosamine, L-ascorbic acid (vitamin C)), sugar alcohols (mannitol, sorbitol) and also disaccharides, such as saccharose and  $\alpha,\alpha$ -trehalose .

Next to their surface-active properties as surfactants, foam producing agents and emulsifiers, several of the resulting molecules show additional benefits as antioxidants and (hydro) gelators (1). Several of them even display antibacterial properties. Thus, the lipid modification of vitamin C leads to oil soluble derivatives, which retain their antioxidant properties and could thus be useful for the stabilization of native oils against autoxidation. They are also excellent hydro gelators and by combining the reducing and gel forming properties we were able to prepare effectively even gold and silver nano particles imbedded and thus stabilized in hydro gels (2). These materials are of considerable medicinal interest. As outlined above, the molecules described in this lecture display a wide variety of highly attractive properties ranging from being surface-active, as emulsifiers, antimicrobial agents, antioxidants and gel forming compounds. It should also be noted that all of the above materials are composed entirely of renewable and thus sustainable raw materials. They are of high potential for numerous practical applications in the areas of nutrition, cosmetics, medicine and new materials.

- 1) S.Nandi, H.-J.Altenbach, B.Jakob, K.Lange, R.Ihzane and M.P.Schneider, *Org.Lett.* **13** (2011) 1980-1983; S.Nandi, H.-J.Altenbach, B.Jakob, K.Lange, R.Ihzane and M.P.Schneider, *Chem.Commun.* **2012**, submitted.
- 2) S.Nandi, dissertation Wuppertal 2012