POLYSACCHARIDES TRANSFORMATION, NEW PROCESSES AND TECHNOLOGIES

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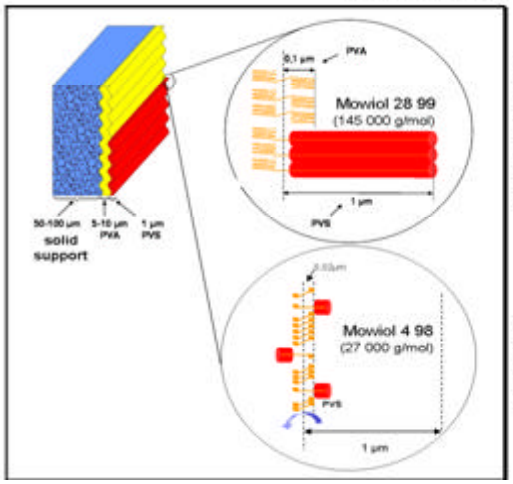
Cellulose-based paper and board products are extremely versatile in meeting societal needs because they are relatively inexpensive, biodegradable and easily recycled [1]. Because of their hydrophilic character and porous structure however, their use as water, grease and gas barrier packaging products requests imperiously an additional coating with synthetic polymers [2].

Chromatogenic chemistry has been proposed by us [3,4] as an alternative pathway. This reaction occurring in solid gas conditions is able to achieve heterogeneous grafting of long chain fatty acids such as stearic acid at the surface of cellulose fibres in industrial settings.

In this paper, we describe first the application of chromatogenic chemistry to various grades of paper and we show that only limited improvement could be achieved in their water barrier properties and none in their grease and gas barrier properties. We describe then the application of chromatogenic chemistry to paper and boards coated with film forming biocompatible polyols such as starch and Polyvinylic alcohol (PVA). Both families of compounds are known to exhibit good grease and gas barrier properties but only in absence of water. Limited improvement in water resistance was observed though the coating and grafting of starch while outstanding improvement in water, grease and gas barrier properties was recorded through the coating and grafting of PVA. In the third part of this presentation, we show that the barrier properties obtained were entirely due to the chemical reaction between PVA and the fatty acid. The reaction gives rise to a 10 fold "ballooning effect" of the PVA sequences involved which produces unusual supramolecular entities involving alternate sequences of native and stearic acid grafted PVA (Polyvinyl steroyl, PVS). We also show that the barrier properties are closely dependent upon the de-acetylation degree of PVA and of their MW (Figure 2.).

Figure 2. Supramolecular structure of stearic acid grafted PVA films, influence of PVA molecular weight.



Reaction between PVA and stearic acids gives rise to a 10 fold increase in PVA molecular weight. The compact supramolecular organization resulting from this «ballooning effect» provides outstanding barrier water, grease and gas properties.

Lower molecular weight PVA exhibit less compact supramolecular organization and provides lower barrier values.

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