

Whey coated plastic films to replace expensive polymers and increase recyclability

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Objectives:

Development of whey protein coated plastic film to

- replace expensive polymers
- increase recyclability
- improve barrier properties.

Goals regarding barrier properties:

1. OTR: $2 \text{ cm}^3 \text{ (STP)} / (\text{m}^2 \text{ d bar})$
2. WVTR: $20 \text{ g} / (\text{m}^2 \text{ d})$

First results (facts):

- Whey protein coatings are brittle
→ incorporation of plasticizers is necessary

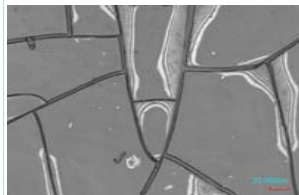


Figure 1: Brittle whey coating without plasticizer



Figure 2: Smooth whey coating with plasticizer (100 Sorbitol)

- Plasticizers increase permeation coefficient
→ evaluation of sufficient concentrations
- Substrate pre-treatment is necessary (e.g. corona)
→ satisfactory adhesion
- An evaluation method that provides quick and valid results regarding whey protein coating properties (according to evaluating examination with scale) was developed
 - Transparency is excellent and independent of plasticizer type
 - Glycerol and sorbitol provide most excellent properties of the coating as observed in preliminary tests

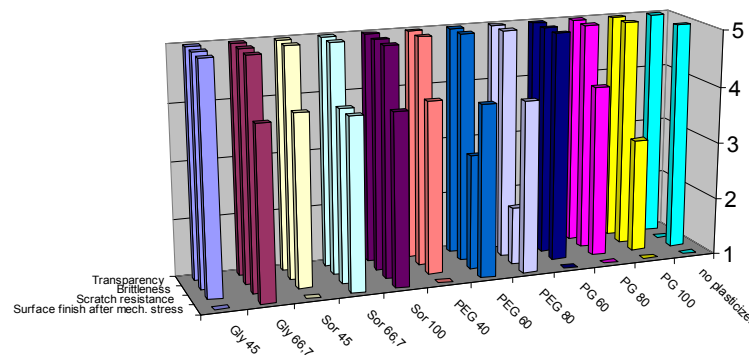


Figure 3: Influence of different plasticizers on various whey layer properties (1: deficient, 5: excellent)

- Propylenglycol containing formulations are not suitable for flexible packaging materials as they do not resist mechanical stress
- PEG200 in high concentrations was not completely solved, thus a inhomogeneous coating was observed

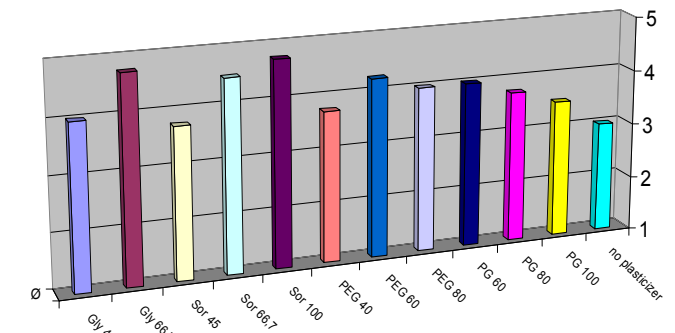


Figure 4: Average property values (equal weighted)

Future activities:

- Further investigations concerning adhesion, drying conditions and barrier properties
- Development of film-forming protein isolates based on sweet whey
- Evaluation of natural antioxidants and antimicrobials
- Optimization of whey protein formulations by the incorporation of antioxidant and antimicrobial additives (active packaging)
- Process modeling regarding industrial application

Project Partners (coordinated by IRIS):

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