

Accepted Manuscript

Title: Phase separation in amorphous hydrophobically-modified starch – Sucrose blends: Glass transition, matrix dynamics and phase behavior

Author: David J. Hughes Gabriela Badolato Bönisch Thomas Zwick Christian Schäfer Concetta Tedeschi Bruno Leuenberger Francesca Martini Giacomo Mencarini Marco Geppi M. Ashraf Alam Job Ubbink



PII: S0144-8617(18)30710-0
DOI: <https://doi.org/doi:10.1016/j.carbpol.2018.06.056>
Reference: CARP 13730

To appear in:

Received date: 26-12-2017
Revised date: 17-5-2018
Accepted date: 13-6-2018

Please cite this article as: David J. Hughes, Gabriela Badolato Bönisch, Thomas Zwick, Christian Schäfer, Concetta Tedeschi, Bruno Leuenberger, Francesca Martini, Giacomo Mencarini, Marco Geppi, M. Ashraf Alam, Job Ubbink, Phase separation in amorphous hydrophobically-modified starch and Sucrose blends: Glass transition, matrix dynamics and phase behavior, *Carbohydrate Polymers* (2018), <https://doi.org/10.1016/j.carbpol.2018.06.056>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Phase separation in amorphous hydrophobically-modified starch - sucrose blends: Glass transition, matrix dynamics and phase behavior.

David J. Hughes^a, Gabriela Badolato Bönisch^b, Thomas Zwick^b, Christian Schäfer^b, Concetta Tedeschi^b, Bruno Leuenberger^b, Francesca Martini^c, Giacomo Mencarini^c, Marco Geppi^c, M. Ashraf Alam^a, Job Ubbink^{d,a,e,*}

^a*H. H. Wills Physics Laboratory, University of Bristol, Tyndall Avenue, Bristol BS8 1TL, United Kingdom*

^b*DSM Nutritional Products Ltd, Research Center Formulation & Application, P.O. Box 2676, 4002, Basel, Switzerland*

^c*Dipartimento di Chimica e Chimica Industriale, Università di Pisa, via Moruzzi 13, 56124 Pisa, Italy*

^d*Food Science and Nutrition Department, California Polytechnic State University, 1 Grand Ave., San Luis Obispo, CA 93407*

^e*Food Concept & Physical Design "The Mill", Mühlweg 10, CH-4112 Flüh, Switzerland*

Abstract

The phase behavior and matrix dynamics of amorphous blends of octenyl succinic anhydride (OSA) modified starch and sucrose was studied as function of blend composition and water content. Phase separation into two amorphous phases, one enriched in OSA starch and the other in sucrose, was confirmed by differential scanning calorimetry (DSC). DSC and ¹H solid-state NMR show that the phase separation is only partial. The glass transition temperature (T_g) of the OSA starch-rich phase was found to be ~ 30 -100 K higher than the T_g of the sucrose-rich phase, depending on blend composition and water content. A novel type of coupling between changes in physical state of the sucrose-rich phase and plasticizer redistribution is proposed, leading to an unexpected increase of

*Corresponding author at: Food Concept & Physical Design "The Mill". Tel.: +41 61 271 12 51

Email addresses: d.j.hughes@bristol.ac.uk (David J. Hughes), gabriela.badolato@dsm.com (Gabriela Badolato Bönisch), thomas.zwick@dsm.com (Thomas Zwick), christian.schaefer@dsm.com (Christian Schäfer), cc.tedeschi@gmail.com (Concetta Tedeschi), bruno.leuenberger@bluewin.ch (Bruno Leuenberger), francesca.martini@pi.iccom.cnr.it (Francesca Martini), giacomomencarini1@gmail.com (Giacomo Mencarini), marco.geppi@unipi.it (Marco Geppi), m.a.alam@bristol.ac.uk (M. Ashraf Alam), jubink@calpoly.edu (Job Ubbink)

Download English Version:

<https://daneshyari.com/en/article/7781143>

Download Persian Version:

<https://daneshyari.com/article/7781143>

[Daneshyari.com](https://daneshyari.com)