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Identification of 8-Nonenal as an Important Contributor to "Plastic" Off-Odor in Polyethylene Packaging

Abstract

Robert A. Sanders,* David V. Zyzak, Thomas R. Morsch, Steven P. Zimmerman, Peter M. Searles, Melissa A. Strothers, B. Loye Eberhart, and Amy K. Woo

The Procter & Gamble Company, Winton Hill Business Center, 6300 Center Hill Avenue, Cincinnati, Ohio 45224

Received for review September 24, 2004. Revised manuscript received December 30, 2004. Accepted January 9, 2005.

Abstract:

Food and beverage products stored in polyethylene (PE) containers may absorb some of PE's volatile minor components and become tainted by its characteristic "plastic" odor. High-density PE containers that had imparted "plastic" odor to an experimental corn chip product were analyzed by simultaneous distillation/extraction to remove the volatile components, by gas chromatography/olfactometry (GC/O) to locate the offending components and by 2-D GC/mass spectrometry (MS) to identify the major "plastic" odor contributor (8-nonenal). The identification was made using high-resolution electron ionization and chemical ionization MS data to narrow the possibilities to two isomers of nonenal, followed by retrieval of reference spectra and confirmatory synthesis. By monitoring 8-nonenal in HDPE containers and corn chips it was demonstrated that 8-nonenal tracks with "plastic" aroma observed in containers and with "plastic" flavor observed in corn chips stored in the containers.

Keywords: Polyethylene volatiles; HDPE; 8-nonenal; plastic off-odor; plastic off-flavor; packaging off-odor

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Keywords: Polyethylene volatiles; HDPE; 8-nonenal; <mark>plastic</mark> off-odor; <mark>plastic</mark> off-flavor; <mark>packaging</mark> off-odor

Introduction

Food packaging can contribute undesirable off-flavors to the foods stored in them (1). Off-flavors imparted to foods or beverages by polyolefin packaging material may be caused by minor components (indigenous components that survive refining or additives such as plasticizers or antioxidants) in the resins (2), or off-flavors may result from oxidation of polyolefin during polymerization or during



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