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# Critical factors in microwave expansion of starchy snacks

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## Abstract

Popping of starchy pellets in a domestic microwave oven has proven difficult compared to pellets expanded in frying oil, and even to microwave expanded popcorn. These pellets encounter problems like uneven popping, burning and the absence of an audible cue for the end of popping. The lack of a moisture barrier, like the pericarp of popcorn, leads to the development of an inverse temperature gradient in the pellets and a significant moisture loss before and after expansion. In this paper we review the hypotheses and solutions for the criticality of microwave popping of starchy pellets, as discussed in scientific and patent literature. We have found a large collection of critical factors and their associated hypotheses, which have been structured via linking them to specific steps in the physical expansion process. We conclude with a list of hypotheses that we view valuable for further investigation.

Keywords: Expanded Snacks, Microwave, Starch, Popcorn.

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## 1 Introduction

2 A large category of starchy snacks are produced via indirect expansion, which hap-  
3 pens if snack pellets are put in frying oil or in a microwave oven (Moraru and Kokini,  
4 2003). Industrial practice and scientific literature show that snack expansion in the  
5 domestic microwave oven is more critical compared to traditional fried snacks. Com-  
6 monly occurring problems are 1) clumping of expanded pellets, 2) the absence of  
7 expansion of some pellets, 3) the burning of some pellets, and 4) the absence of  
8 an audible cue for the end of popping (Kershman et al., 2000). Similar problems  
9 have occurred with microwavable popcorn in the period of their market introduc-  
10 tion, but they are reasonably solved now. This stage of product development has

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