Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Increasing the maximally random jammed density with electric field to reduce the fat level in chocolate R. TAO[1], H. TANG, Temple Univ — Chocolate is one of the most popular food types and flavors in the world. Unfortunately, at present, chocolate products contain too much fat, leading to obesity. For example, a typical molding chocolate has various fat up to 40% in total and chocolate for covering ice cream has fat 50 -60%. Especially, as children are the leading chocolate consumers, reducing the fat level in chocolate products to make them healthier is important and urgent. While this issue was called into attention and elaborated in articles and books decades ago and led to some patent applications, no actual solution was found unfortunately. Why is reducing fat in chocolate so difficult? What is the underlying physical mechanism? We have found that this issue is deeply related to the basic science of soft matters, especially to their viscosity and maximally random jammed (MRJ) density φ_x. All chocolate productions are handling liquid chocolate, a suspension with cocoa solid particles in melted fat, mainly cocoa butter. The fat level cannot be lower than 1-$\varphi_x$in order to have liquid chocolate to flow. Here we show that that with application of an electric field to liquid chocolate, we can aggregate the suspended particles into prolate spheroids. This microstructure change reduces liquid chocolate's viscosity along the flow direction and increases its MRJ density significantly. Hence the fat level in chocolate can be effectively reduced. We are looking forward to a new class of healthier and tasteful chocolate coming to the market soon.

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Date submitted: 04 Nov 2015 Electronic form version 1.4