Department of Materials Science and Engineering,

PhD Defense

Friday, November 8th ,2024 at 2 pm
Hill Seminar Room (LeBow240)
Online – Zoom link: https://drexel.zoom.us/j/83691469134

Understanding the Stress-Induced Phase Transformation of Chlorpropamide (CPM) in Tablet Compaction

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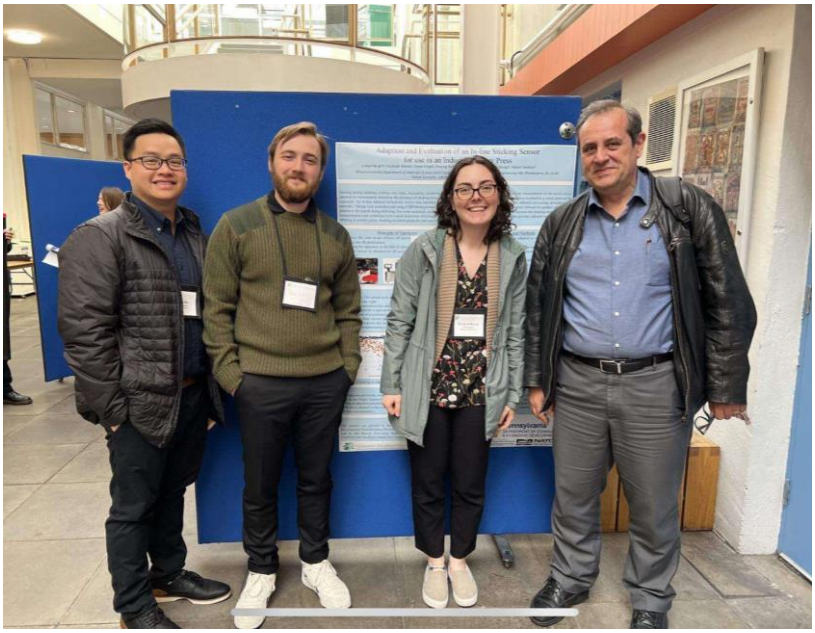
Abstract

During tablet compaction, a crystalline form of active pharmaceutical ingredients (APIs) may transform into another crystalline state (polymorph) depending on the local stresses. This phenomenon presents a major challenge during R&D stages and poses regulatory risks to new drug applications. Over the past years, compression-induced phase transformation of Chlorpropamide from form C (CPM-C) to form A (CPM-A) has attracted attention; however, current understanding remains limited and a comprehensive framework to describe this phenomenon is still elusive. Prior studies on the polymorphic transformations in CPM-C tablet typically reported conversion percentages as a function of applied compaction pressure. Recent studies have suggested the possibility of local variation in the transformation due to wall friction, but they had unclear explanations of the frictional contribution to this phenomenon.

In this work, a methodology was developed to map the phase transformation throughout the cross surface of a split tablet. The effect of tablet shape and frictional conditions on the distribution of local conversion was investigated. Additionally, we identified the particle plastic deformation of CPM-C that serves as fundamental driving force behind its transformation, as observed on both macroscopic and microscopic scales. Our work sheds new light on the problem of phase transformation during compaction, offering an enhanced understanding that can be beneficial in optimizing formulations as this phenomenon arises during pharmaceutical R&D.

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