DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Department of Materials Science and Engineering,

PhD Proposal

Monday, Nov. 21 @ 8AM
LeBow 240 Hill Conference Room
https://drexel.zoom.us/j/84188480160

Experimental & computational studies on air entrapment during powder compaction and its effects on particle cohesion

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Abstract

In the aim of producing pharmaceutical oral dosage forms in large volumes, tablets are compacted from powder at high speed. Defects in the final tablet such as lamination and bubbles are commonly attributed to air entrapment. Air is entrapped through the reduction of porosity and sealing of channels during compaction. In slower compactions, the reduction of such defects has been noted. Literature has shown that the development of air pressure across the powder material is not uniform, and forms gradients due to compaction parameters and compact and tooling geometry. Lacking in previous works are a dynamic evaluation of entrapped air and a direct influence of this air volume on the tablet strength. Additionally, the progress from a single bond failure to a macroscale defect has not been explored given interstitial air pressure. This work proposes a sealed die apparatus to evaluate the volume of entrapped air with subsequent diametral compression for tensile strength reduction measurement. Furthermore, this work develops multiple finite element models for the evaluation of single and multiple cracks produced in continuum and particulate systems. It is the overall aim of this work to improve the understanding of powder behavior during compaction which will enable more efficient design of powder compacts.