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## Flow behavior of multi-scale pharmaceutical granules using advanced engineering and imaging techniques

**Saleh S Al-Zahrani**

King Fahad Armed Forces Hospital Jeddah, KSA

Good powder flow behavior is very crucial and essential multiple industrial applications such as pharmaceutical and engineering manufacturing. The main aim of this research project is to apply melt-granulation and wet granulation techniques in multiple binding ratios to improve the particle size and morphology. Ring shear cell tester RST-XS was applied as advanced engineering technique to assess the granular flow trends. Digital particle image velocimetry (DPIV) was used to understand the temporal and spatial velocity distribution of the granular flow inside typical case of silo with internal angles 45° and 70°. The influence of both granulation methods on physiomechanical properties for the prepared granules was evaluated. Diverse variables were considered for the prepared granules such as granulation method, binding ratios, particle size ranges and different hopper geometries. The output results were used to measure granules flowability, cohesivity and wall friction. Two hopper geometries i.e., conical and wedge-shaped hopper were designed using the data obtained from the ring shear test results. The results showed that granules prepared by wet granulation had better flowability than that prepared using melt granulation. This trend is in agreement with the outcomes of applying shear cell test stated earlier. In addition to that, granules moderately coarse and coarse were able to produce a symmetric flow trend within the flow chambers. New understandings are provided on the flow behavior of granules in terms of different granulation method, single-particle characteristics and geometrical conditions. The integrated approach adopted here viz., designing the flow geometries based on using classical shear cells and DPIV provides a holistic and better pathway for designing powder flow geometries.

### Biography

Saleh S Al-Zahrani has completed his MSc degree in Pharmaceutical Engineering from Leeds University, UK. He is working as a Supply Chain Director at King Fahad Armed Forces Hospital in Jeddah, Saudi Arabia.

salzahrani@kfah.med.sa

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