Abstract Submitted
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Characterizing titanium powder: morphology, flow and segregation[1] NICHOLAS A. POHLMAN, JOHN A. ROBERTS, MATTHEW GONSER, Northern Illinois University — Powder metallurgy manufacturing with titanium could achieve near-net shape for parts with high strength-to-weight ratio. However, pure titanium (Ti) powders have large aspect ratios that prevent smooth flow. Features of Ti powder were examined experimentally to understand its limited flowability. The surface morphology was measured using a SEM for both raw powder as well as those made "uniform" via milling. The poly-disperse mixture had particle sizes between 45–700 μm, of which a significant concentration were $< 45\mu$m, which results in a very steep and unsteady angle of repose when the powder was placed in a rotating tumbler. The flat surface and steady flow typical of macroscopic particles is not present, but instead has slumping motion as material piles up and collapses intermittently. Spectral analysis indicates that increasing Froude number causes the slumping behavior to move to higher frequencies, but spread over a larger range. Size segregation causes porous streaks to form at the periphery of the tumbler where the angular separation of the streaks decreases with increasing Froude number. The overall conclusion is that more narrow ranges of particle size are necessary to yield usable titanium in powder metallurgy manufacturing.

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