

Development of powder flow characterisation methodology for Additive manufacturing process

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Additive manufacturing (AM) process is an official industry term to describe the recent technology that build an object by adding layer upon layer of powdered materials such as metal, plastic, etc.

The important aspect of AM is to provide low energy, low cost and, low waste manufacturing routes for high value products. This requires control and in depth understanding of the process and powder characteristics for specific application and certain machine. One of the major characteristics of the feed powder for the manufacturing is their flowability and its the assessment is crucial in order to create good-quality powder layer for AM.

For this process, the interest is to investigate a “reliable” flow behaviour of loosely compacted powders. To achieve this aim, it is important to follow a method to measure the powder flowability at very low stresses (10-100 Pa) and applicable to the AM process, as common techniques can reliably provide powder flow characteristics only for the consolidation stresses of above 1KPa. Ball indentation technique provides a measure of hardness which can be related to flow resistance and flowability for loosely compacted powders. However, the challenge of this technique is to attain a relatively smooth surface for loose powder beds and a reliable indentation process and measurement.

In this study, a systematic and complimentary technique is reported for a reliable ball indentation on loosely packed metal powders to characterise their flowability at low consolidation stresses applicable to the 3D printing process.