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## 2.36 A multi-species powder dropper for magnetic fusion applications

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Injection of solid powders has been used in fusion research for various applications, including wall conditioning and pedestal control. Due to the physical properties of various materials, typically, a powder injector is designed and optimized to handle a specific kind of powder. We present a device for controlled injection of a variety of materials in form of powder. The system implements four independent feeder units, arranged as to share a vertical drop tube. Each unit consists of a 30 ml reservoir, coupled to a horizontal linear pad, where a layer of powder is advanced by piezo-electric agitation at a speed proportional to the applied voltage, until it falls into the drop tube. The dropper has been tested with a range of impurities of low (B, BN, C), intermediate (Si, SiC) and high Z (Sn) and a variety of microscopic structures (flakes, spheres, rocks) and sizes (5-100  $\mu\text{m}$ ). For low Z materials (e.g. B, BN), drop rates  $\sim 2\text{-}200$  mg/s have been obtained with excellent linearity, repeatability and uniformity. A calibrated LED-based flow-meter allows measuring and monitoring the drop rate during operation. The fast-response of the four feeders allows combining long duration and pulsed injections, providing a flexible tool for controlled-dose impurity injection in fusion plasmas.

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