

## Vertical Transportation System of Particles

We are looking to out-license the technology for its commercialization.

### Simple and compact powder handling system with excellent dust resistance using vibrating tubes

#### ◆Background

Powder handling technology is used in various fields such as chemical, food, and pharmaceuticals production. In recent years, such powder handling is researched even for applications in space environments to collect lunar regolith in order to use them as a source of water and oxygen on the moon.

To transport powder vertically upward, pneumatic conveying systems are commonly used with bucket elevators and screw conveyors. However, such system requires large-scale equipment and dust control as well as uses liquid and gas in the process thus cannot be used in diverse environments such as outer space.

#### ◆Description

Researchers at Kyoto University focused on a powder transportation system that can convey powder vertically using only vibration of a tube, and have developed a new enhanced powder transportation system. The simple mechanism allows for easy control, compact size, and excellent dust proofness. Furthermore, the new system can transport non-spherical particles, which has been difficult with the conventional powder transportation system, leading to expansion of applications.

- ✓ Improved transportation performance of non-spherical particles
- ✓ Increased flow rate
- ✓ Compact and simple vibration transport mechanism

#### ◆Development Status

- Vertical transportation of spherical glass particles (up to 1,500 μm in diameter) and non-spherical particles (1 μm to 1 mm in diameter) that mimic the lunar regolith has been verified.

#### ◆Applications

- Powder transport process in production of various particles (eg. cosmetics, chemicals and food products)
- Selective laser sintering 3D printers
- Resource development and sampling
- Resource development on the Moon and Mars

#### ◆Offer

- Patent License
- Collaborative Research

#### ◆Contact

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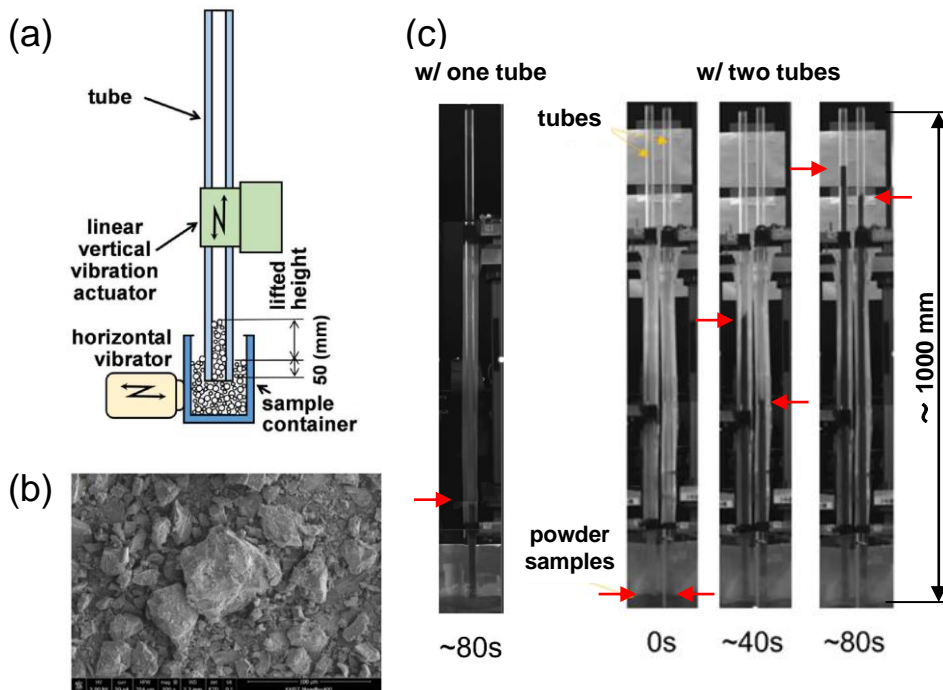


Fig. Powder vertical transport system using multiple tubes (1 m long each)

- (a) Schematic diagram of the system using one tube (Kawamoto et al. 2021)
- (b) Non-spherical particles mimicking lunar regolith
- (c) With the new system, two tubes were positioned in close proximity and vibrated simultaneously. As a result, the powder sample consisting of non-spherical particles was conveyed to the uppermost parts of both tubes. In contrast, with the system using one tube, the sample was conveyed only to the middle part of the tube.

