

Making solid version chromatography ~Separation and identification of solid particles by magnetic field gradient using microgravity~

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Solid particles released in a monotonically decreasing magnetic field under microgravity move translational motion caused by field gradient force. The acceleration of a particle is independent of the mass of the particle and depends only on the magnetic susceptibility of the material. Therefore, it is expected that particles will be separated and translated into different groups for each type of material. Using this principle, we have demonstrated that a small neodymium magnet and a self-made microgravity generator can separate and collect a mixture of solid particles for each type of material. The microgravity required for the experiment was generated in a small drop capsule (30 × 30 × 20 cm). The fall distance is 1.8 m, and the microgravity duration time is about 0.5 seconds. A neodymium magnetic circuit, a high-speed camera, a sample collection plate, and a lighting equipment were placed in the drop capsule. The diamagnetic material particles of 6 kinds of inorganic materials and 6 kinds of organic materials could be collected on the collecting plate as a particle group for each different material. The magnetic susceptibility χ of the sample can be obtained by analyzing the recorded particle motion. Therefore, the correlation between the position of the separated particles on the collecting plate and the magnetic susceptibility χ is obtained. The material can be estimated from the position on the collection plate. It can be applied as a "solid chromatography" technique for separating a solid mixture into individual materials prior to precision analysis.

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