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Tool condition monitoring of disc mills- Monitoring of the proper swing aggregate function

Abstract

Disc mills are used to comminute sample material for analysis by XRF, XRD or other methods. Here we present a method for online tool condition monitoring (TCM) of the proper swing aggregate function by means of acceleration measurement (patent pending). We show that this TCM approach is capable to detect even minimal deviations in the motion of grinding vessel due to, e.g., wear of the horizontal springs. The use of a TCM system for disc mills will have a significant impact of the reproducibility of the sample preparation process.

Key words

• **Disc mill** • **Tool Condition Monitoring** • **Swing Aggregate** • **Acceleration Measurement**

Introduction

Disc grinding mills are standard equipment in many laboratories specializing in sample preparation and analysis of non-organic material. The operation principle of disc mills is that a motor puts the grinding vessel into an eccentric motion. This causes a ring and/or stone (so called grinding set) to move inside the vessel leading to comminution of the material being ground. Basic principles of particle size reduction are shearing, impacting and compression of the material between ring, stone and the wall of the grinding vessel.

In order to guarantee an efficient grinding process it is essential that ring and stone make a circular motion along the wall of the grinding vessel.

The circular motion is achieved by mounting of the grinding vessel on the so called swing aggregate of the disc mill (Figure 1). Horizontal and vertical springs within the swing aggregate guide the vessel into a precise circular motion and prevent it from swinging sideward or upward. Deviations of the grinding vessel from the optimal circular path have an adverse effect on the grinding efficiency resulting in a decreased reproducibility of the grain size distribution. Eventually, this may lead to an increased bias of the analytical results using X-ray spectroscopy or diffraction analysis.

In this application note, we present a method for online monitoring of the proper swing aggregate