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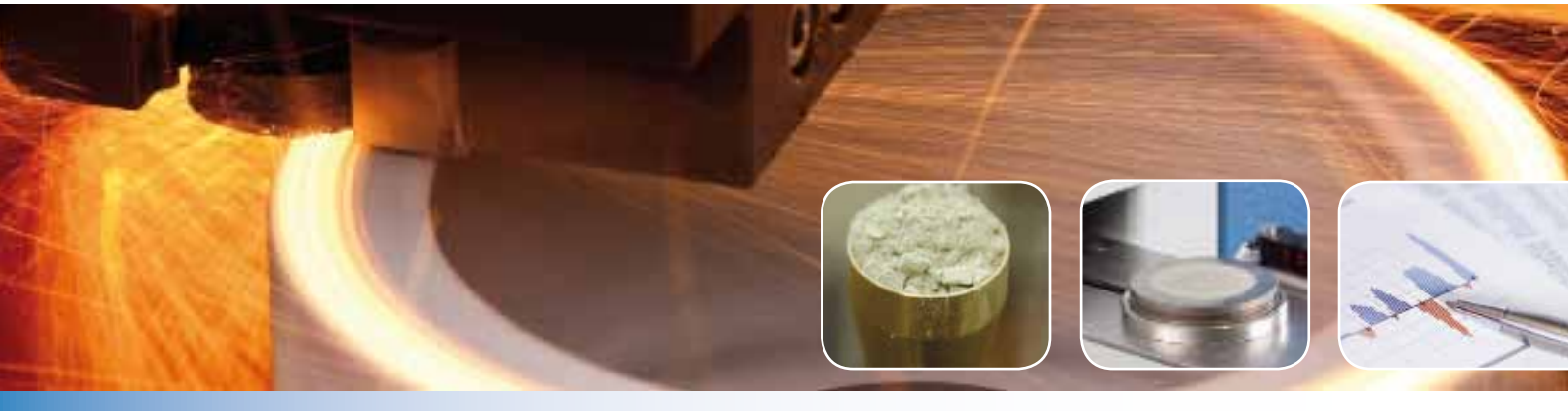

# Minimizing moisture uptake after sample preparation of hygroscopic material for XRF analysis


## Abstract

**The preparation of lime based products is often done by XRF analysis. The grinding aid HMPA 40 prevents rapid moisture uptake after sample preparation.**



## Keywords

**grinding • pressing • grinding aid • cellulose • moisture**


## Description

Hygroscopic materials like lime (CaO) have the tendency to take up moisture very quickly. This leads to a volume increase of the pressed sample material. This increase results in the bursting of the pressed pellet (Fig.1). Even after a few minutes the analytical surface is lifted out of the steel ring. The uplift results in an inoperative pressed pellet for XRF analysis. To avoid bursting of the sample it is recommended to use a waxy binder and store the sample in a dessicator immediately after pressing. Material loss inside the spectrometer is a possible risk which has to be minimized.

Fig.1: Pressed pellets of different lime samples several hours (~12 h) after the preparation exposed to room humidity. They burst after moisture uptake. Without the addition of HMPA 40 with a wax portion will burst even after some minutes.

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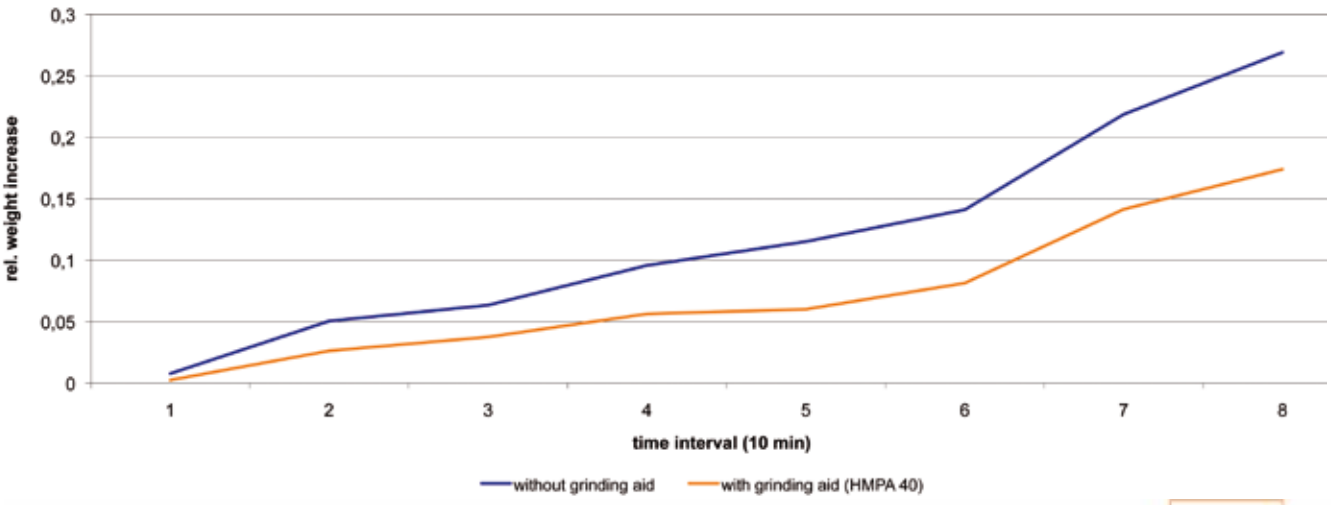


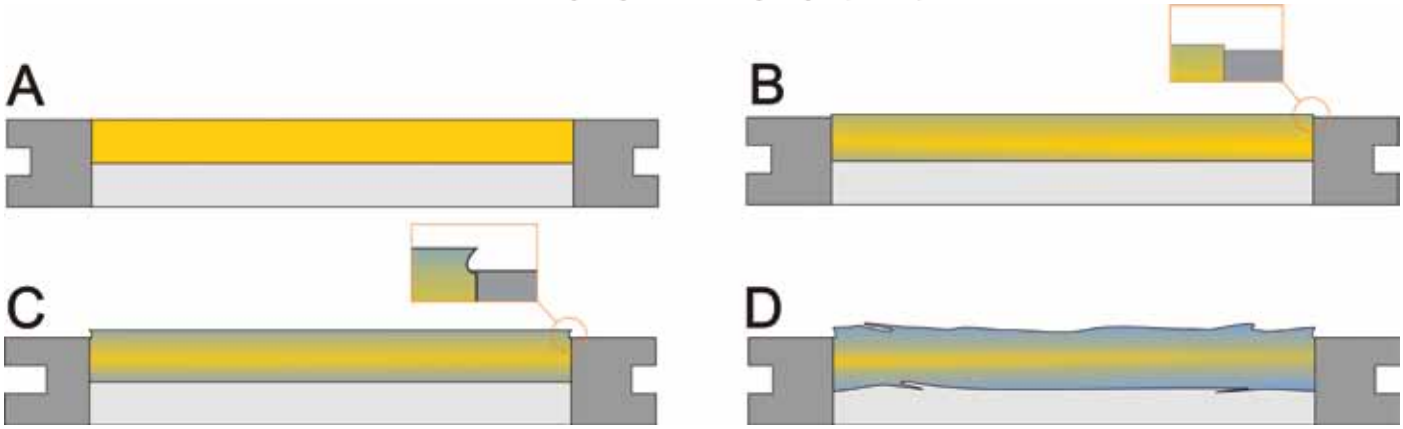


Fig.3: Schematic illustration of the moisture uptake of pressed pellets of lime after sample preparation without grinding aid.

Stage A: Original state after sample preparation.
Stage B: Uplift of the analytical surface due expansion.
Stage C: Capping of the analytical surface and first breakages of the surface.
Stage D: Bursting of the material to compensate moisture uptake.

The moisture uptake is characterized by different stages of expansion (Fig.3). In the first stage the analytical surface is slightly elevated to the steel ring (stage B). In the second stage (C) the sample begins to cap and embrittled zones occur at the contact of sample and the inner edge of the steel ring. In a last stage (D) the pressed material is completely burst.

This problem can be overcome by using the HMPA (HERZOG mill and press additive) as an additive. This grinding aid is used in many XRF applications and is composed of microcrystalline cellulose and a waxy component. This waxy component seals the surface of the sample against moisture and improves the stability. Accordingly, the moisture uptake is delayed causing higher stability of the pressed pellets. Additionally, HMPA 40 facilitates the material output after milling and reduces the risk of contamination during sample preparation (see application note No.3/2012).

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