MeltPrep

lets you focus on research

VACUUM COMPRESSION MOLDING

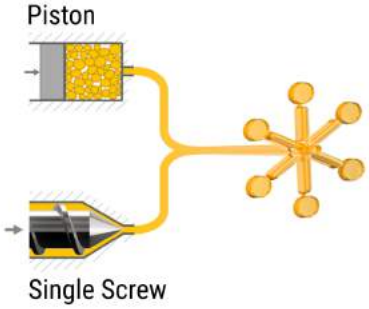
Problem Definition

The processing of polymer powders is a basic procedure in the plastics industry. Established large scale processes are e.g. extrusion or injection molding. However, on laboratory scale with small material quantities this can be a very tedious task.

Conventional preparation approaches like compression and injection molding require large-scale equipment and are expensive in terms of investment costs. Nevertheless, specimens made using these methods regularly are of unsatisfactory quality and require time consuming pre-conditioning and process development.

Powder

Homogeneous Sample

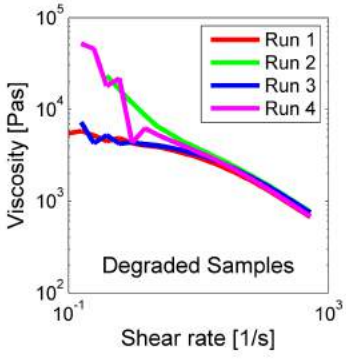


Injection Molding

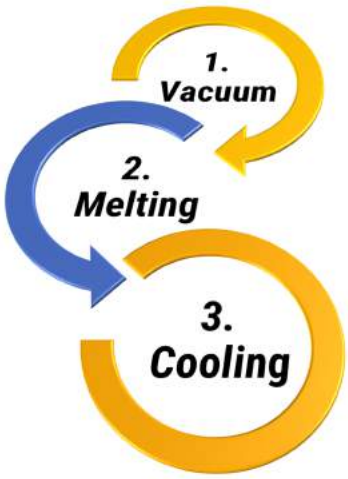
Compression Molding

Air voids or possible moisture inclusions often remain within the samples, impairing subsequent experiments and measurements. For example in injection molding, viscous dissipation and strong extensional flows can cause thermal or mechanical degradation. In addition, pronounced polymer chain orientations may remain within the solidified sample. Thus, erroneous results are often obtained if samples are prepared using conventional methods.

Problems associated with conventional approaches:

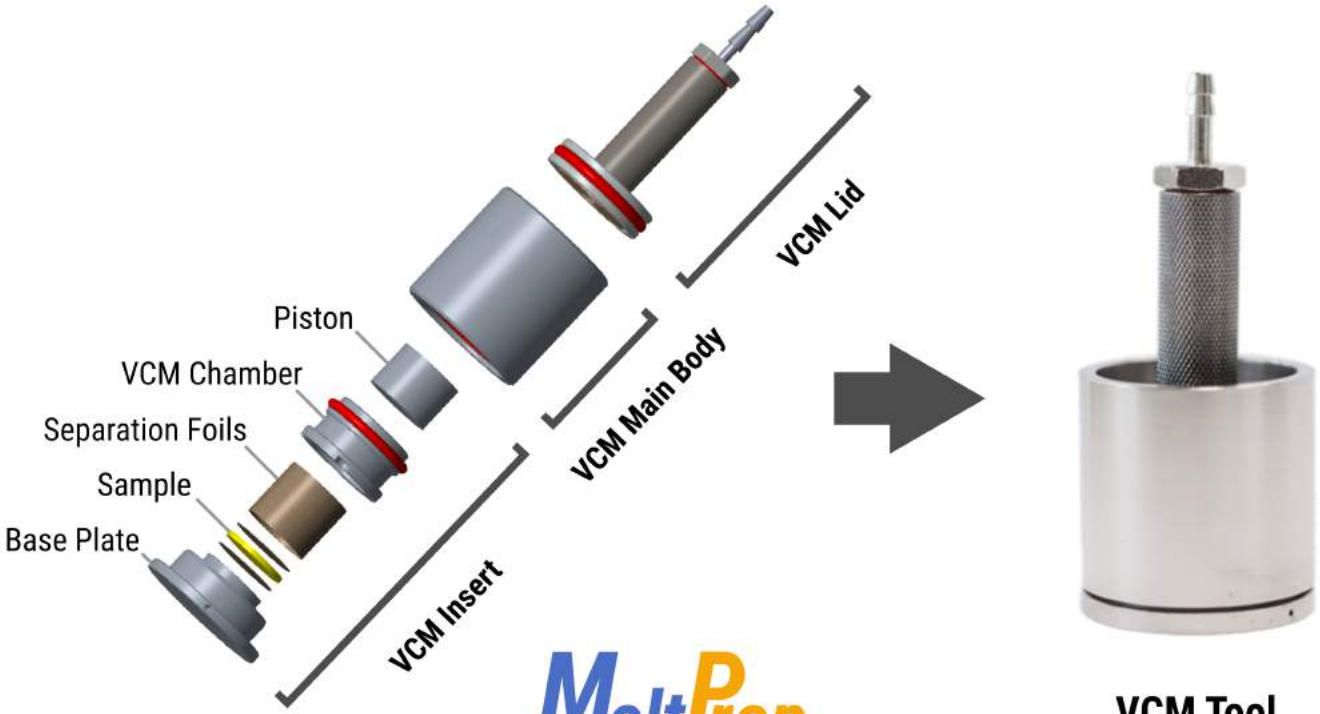


The MeltPrep Solution



MeltPrep has developed a Vacuum Compression Molding (VCM) process to transform powdery thermoplastic materials in homogeneous specimens, without altering the source materials characteristics due to degradation.

The key advantage is the utilization of vacuum, which effectively prevents air or moisture inclusions within the specimen. Thanks to the easy-to-use VCM Tool, samples with unmatched quality can be produced within minutes without tedious process development.



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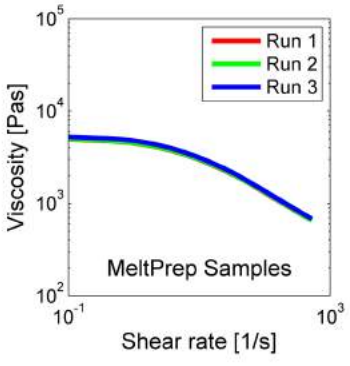
VCM Tool

The VCM Tool has a modular design and consists of three parts: VCM Main Body, VCM Insert and VCM Lid. The sample is formed inside the VCM Insert, which is interchangeable within the Main Body. Various sample geometries and dimensions are feasible.



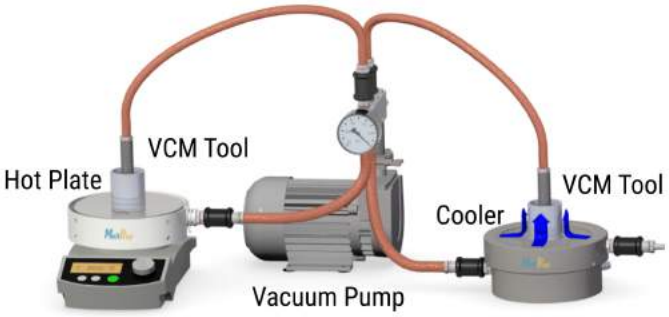
VCM Essentials and the Preparation Cycle

MeltPrep offers an optimized bench-top solution called VCM Essentials consisting of a hot plate, a vacuum pump, and a cooling unit. The hot plate and cooler are equipped with vacuum mountings to hold the VCM Tool and ensure defined contact pressures and heat transfer conditions. The preparation process consists of 3 steps:

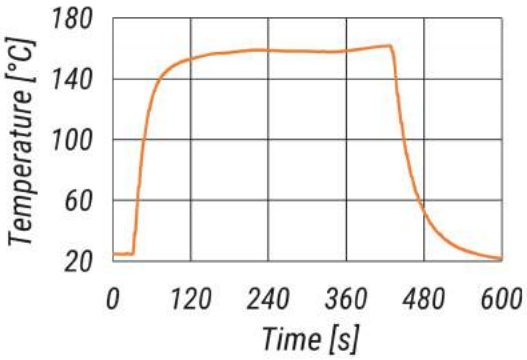
1. Step VCM Tool Filling & Assembling

2. Step Preparation Cycle on VCM Essentials

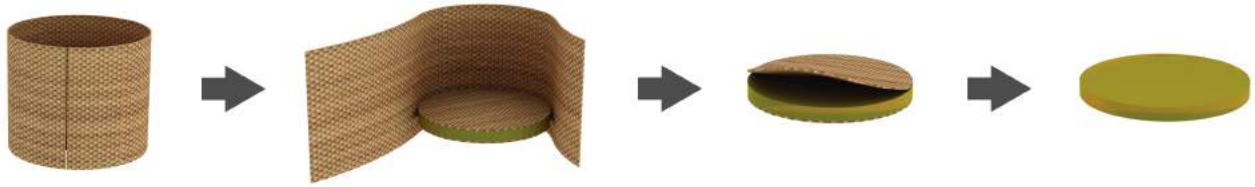
Vacuum → **Heating** → **Melting** → **Cooling**



VCM Essentials



3. Step VCM Tool Disassembling & Demolding



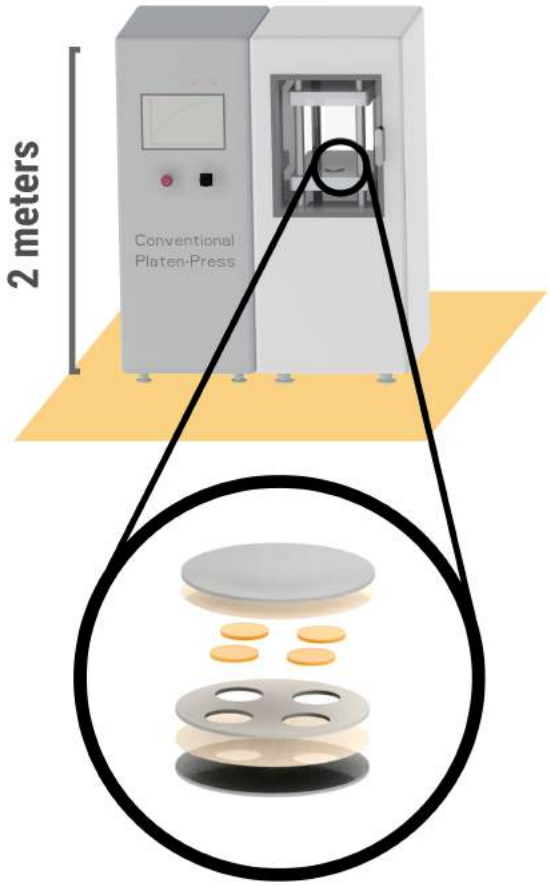
Ease of Operation

Short Preparation Times

Reproducible Temperature History

Conventional Press

Floor standing



▪ Large Equipment

Designed as multipurpose machines to fulfill the needs of various applications. Long duration for temperature changes and evacuation.

▪ Sticking & Fixed Volume

The density of the material changes throughout the preparation resulting in voids. The sample sticks to metal interfaces leading to damages during demolding.

▪ Mechanical Press

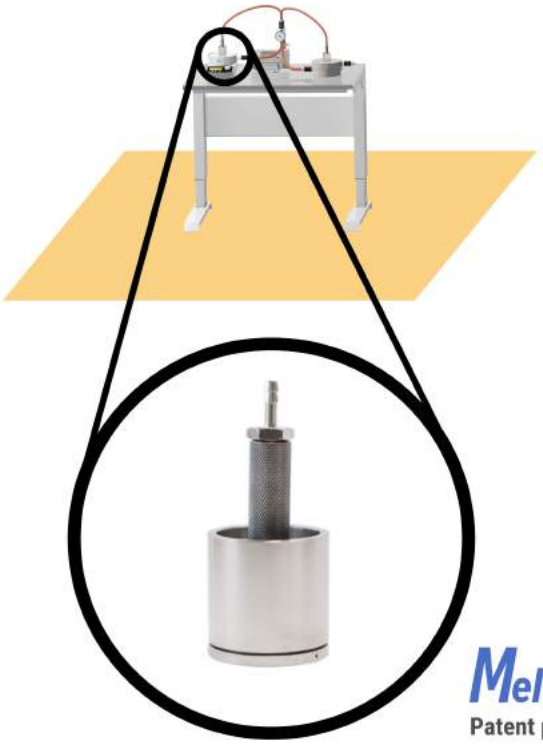
High pressures are frequently required in other applications resulting in heavy hydraulic presses. Thus, long preparation cycles are required, which promote degradation.

▪ Unavoidable Waste

In many cases large sheets are molded and smaller samples are cut out from seemingly suited regions.

VCM Tool

Bench-top Scale



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▪ Dedicated Sample Preparation

The mold dimensions are minimized to enable rapid preparation. Sample preparation times below 10 minutes are feasible, which is particularly suitable for thermo-sensitive materials.

▪ Separation Foils & Variable Volume

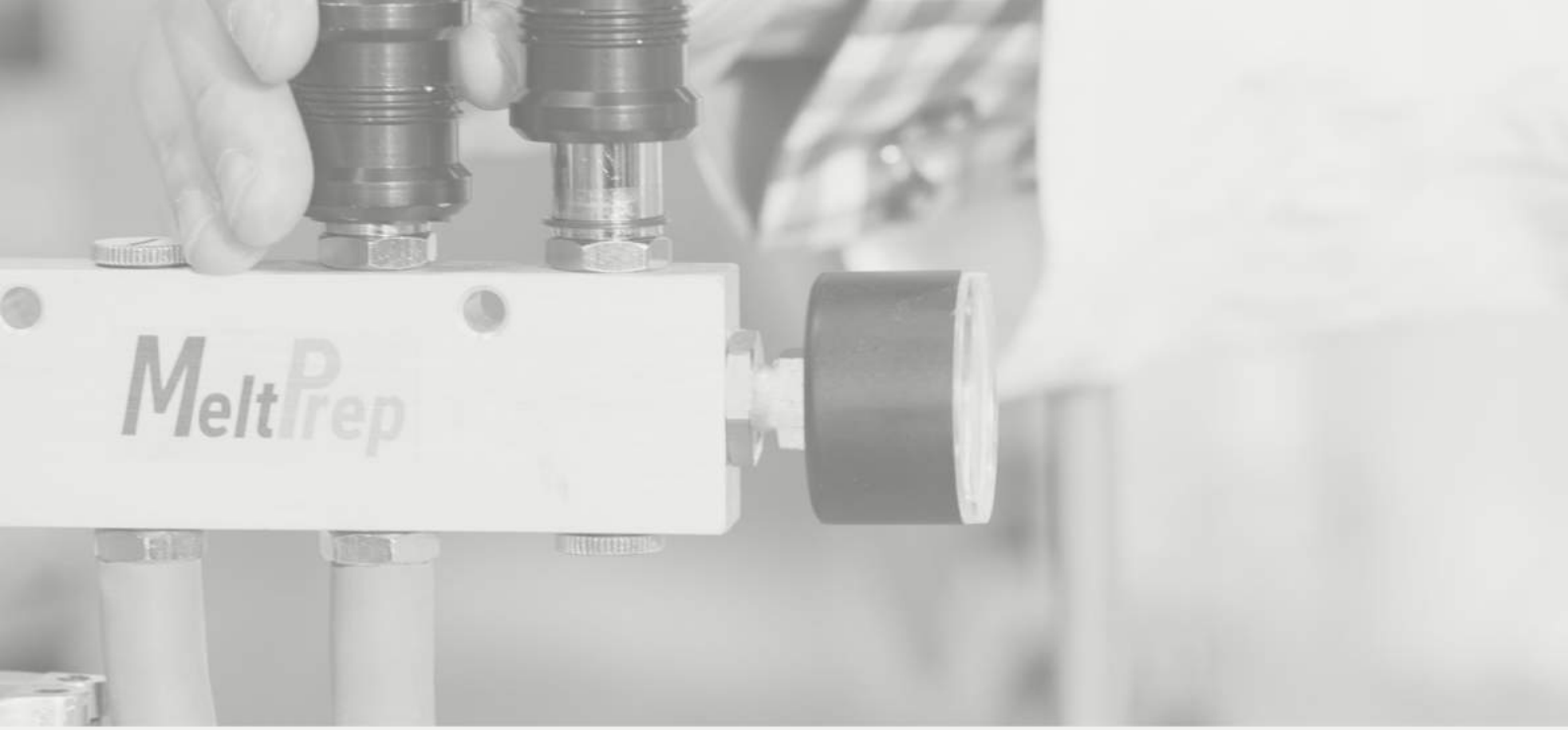
The unique foil arrangement enables damage-free demolding. Its adaptable geometry is always perfectly matching the amount of sample material.

▪ Vacuum Compression

Vacuum is utilized to build up the required compressive force. Additionally, oxidation and air or moisture inclusions are eliminated by fully evacuating the VCM tool.

▪ Lossless Preparation & Easy to Clean

No residues remain within the tool after preparation. The entire amount of used material will form the sample. The VCM Tool can immediately be reused without tedious cleaning.



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MeltPrep is a spin-off of the RCPE GmbH

research center pharmaceutical engineering

Science Park Graz