

HKP in the Simoloyer®

Media Reload Processing (MRP) for SMART PM2020

DispersoidChargingUnit (DCU)

High Kinetic Processing (HKP) in the Simoloyer® represents the most advanced technique for Mechanical Alloying (MA), High Energy (HEM) and Reactive Milling (RM) for making Nanostructures. General processing modes are the common batch-process (01), auto-batch (02) with automatic loading and unloading as well as the semi-continuous processing route (03) for insitu separation/classification by the adapted carrier-gas/multiphase flow circuit.

Media Reload Processing (MRP)

On route to automatic processing at industrial importance at best economic condition, Media Reload Processing (MRP) was developed in 2023 as a variant to batch- and/or auto-batch mode.

MPR allows entirely discharging of processed material (PM) including grinding media (GM) utilizing MediaProductSeparator (MPS) for PM/GM-separation outside Simoloyer® under continued atmosphere control. Different RotaryVaneFeeder (RVF) allow reloading GM (RVF ZS-GM) and charging starting powder material (RVF ZS-ZP).

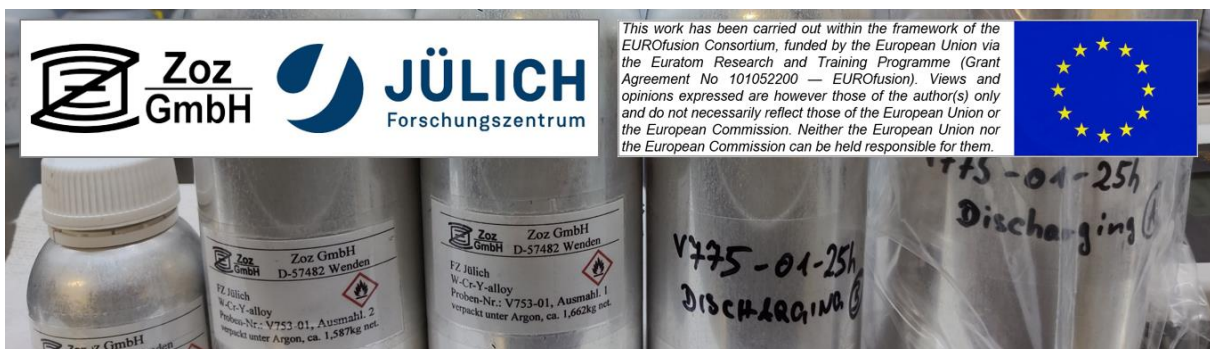
MPR can substantially improve cooling efficiency (heat-storage GM), significantly reduce total processing time (discharging time towards zero) and by the latter may improve product quality due to constant PM/GM wt-ratio at all time. The former process-bottleneck, namely the draingrating for discharging under controlled atmosphere at the absence of dead-zones as well as discharging itself under severe alteration of PM/GM wt-ratio, can be eliminated [1].

Simoloyer® automatic loading/charging

At auto-batch and so at MRP, Simoloyer® is automatically loaded from one or more ChargingContainer CFB. Portioning is provided by RVF ZS-ZP at appropriate precision over its rotation number. To some extent, portioning precision can be increased by decreasing mass-transportation per rotation at the rotary vane feeder.

SMART material for NuclearFusionReactor 1st wall

SMART describes a safety-issue material W-Cr-Yttrium for the 1st wall plasma facing side at the Fusion Power Plant. In NuclearFusion (NF) operation, SMART behaves like Tungsten. In case of severe accident e.g. at a loss of coolant at first wall temperatures >1000°C, SMART forms a self-propagating protective surface layer [2]. In early stage, utilizing Simoloyer® CM20, processing times were reduced from 60h (lab, g-scale) to 20h (kg-scale). The composition at present is W-11.4Cr-0.6Y (wt%), once commercialized, SMART shall become PM2020 [3].



Charging small component fraction, insitu portioning

Due to its small dispersoid-fraction (Yttrium), SMART describes another challenge towards HKP at industrial manufacturing. Precise portioning/vessel-loading now becomes a strict requirement that in auto-batch processing could not have been provided under the technical state of the art. In NF, ODS/NFA structural materials for the plasma face-away side at 1st wall, undergo identical relevance.

In batch processing, any component fraction by weight can be loaded one by one using given airlocks, if necessary then premixed and then processed. To achieve a precise composition in auto-batch, pre-mixing of final composite is not acceptable due to the potential of subsequent de-mixing in the ChargingContainer CFB and/or piping and interconnections enroute to the processing chamber.