Granulated Materials

Easy handling for improved process efficiency

MilliporeSigma is the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany
Accelerating Manufacturing Processes

Caking and clumping of chemicals, dust formation and laborious weighing have a negative impact on manufacturing efficiency and may even lead to process interruptions, quality deviations and operator safety risks.

Buffer preparation, to name one example, is a core operation in pharmaceutical manufacturing and is closely linked to plant schedule and capacity. Just-in-time, flexible handling of chemical raw materials is key – delays are not an option.

Granulated raw materials are free-flowing and easy to handle. Their greatly reduced caking behavior facilitates processability, speeds up manufacturing processes and increases operator safety.

Discover our innovative granulated raw materials:
- Ammonium Sulfate Granulated
- Glycine Granulated
- Potassium Chloride Granulated
- Sodium Chloride Granulated
- Urea Granulated

- Greatly reduced caking
- Better handling and processability
- Increased operator safety
- Multi-compendial
- Emprove® Expert products with low endotoxin levels for high risk applications

Dry Granulation by Roller Compaction

- Compression force only
- No water or other additives used
- Ideal for highly sensitive materials

The raw materials are compacted by dry granulation. This water and additive-free process uses compression force to condense the materials. Compared to other compaction methods, dry granulation is very gentle and particularly appropriate for heat and moisture sensitive materials. By using this process, we ensure that characteristics of the raw materials are preserved and the highest quality standards are met.

The quality, consistency and compliance of our raw materials is fully documented and supported by a secure and robust supply chain.
**Material Properties**

Caking is a chemical product property of various compounds, such as glycine and urea, and can lead to complete solidification.

Our granulated materials show significantly reduced caking even under long-term storage conditions. Occasionally emerging small clumps can be easily broken. In contrast, bulk material shows intense caking up to monoblock formation.

The picture on the right shows granulated urea in comparison to standard bulk material as an example.

**Flowability**

Our granulated materials provide excellent flowability, whereas respective bulk material often shows average or even non-satisfactory results. Free-flowing characteristics of granular material strongly improve handling and processability.

Flowability was determined by powder analyzer, a method measuring the avalanche angle necessary to induce material flow. Lower avalanche angles equal better flowability.

**Abrasion**

Sustained integrity of granules during transport and storage is key to preserve their positive characteristics. Granulated materials exhibit excellent integrity with very low abrasion rates.

Material integrity was tested using an abrasion drum with ceramic balls. The drum was rotated at 20 rpm for 10 min and the percentage of fine particles mass <500 µm was determined.

**Dissolution**

Dissolution behavior of granulated material is comparable to bulk material. Studies showed slightly faster dissolution of bulk material due to larger surface area.

Dissolution studies were performed by dissolving 80 g of the respective material in 800 mL of purified water. Samples were stirred at 250 rpm at room temperature and particles were determined by focused beam reflectance measurement (FBRM).
The Emprove® Program

Your fast track through regulatory challenges.

Ensuring the compliance of your pharma and biopharma products involves the compilation of a vast amount of data, which can be time- and resource-intensive.

In order to facilitate and accelerate this process, we developed our Emprove® Program. It includes 400 pharma raw and starting materials and a selection of filtration and single-use products.

Each product in the portfolio is complemented with three different types of dossiers supporting you throughout the different stages of your operations: qualification, risk assessment, and process optimization – all designed to help you speed your way through the regulatory maze.

Find out more at: SigmaAldrich.com/emprove

### Ordering Information

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Cat. No.</th>
<th>Pack Size</th>
<th>Packaging</th>
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<tr>
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<td>1 kg</td>
<td>PE bottle</td>
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<td>1.04161.9026</td>
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To facilitate qualification processes, the 1 kg package is available for 3 different batches.

For further information, please visit SigmaAldrich.com or contact your local sales representative.