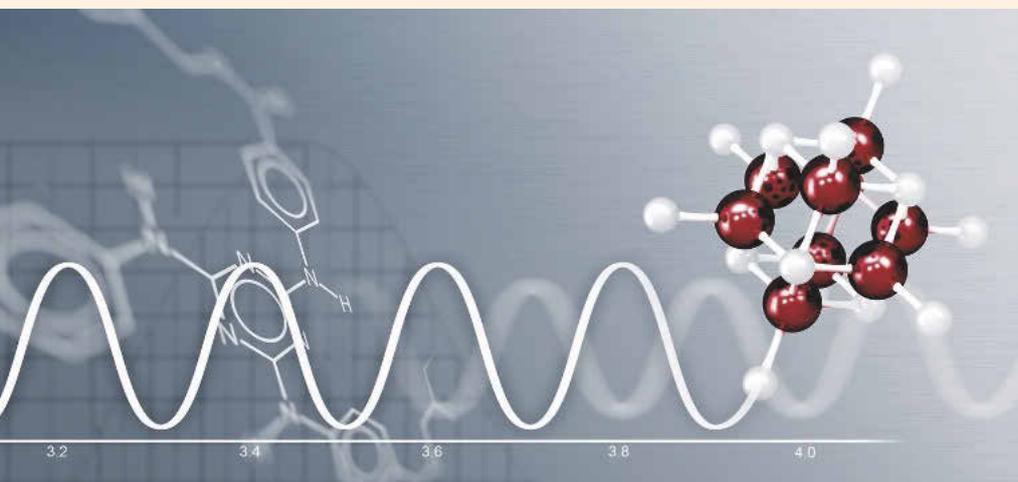


Particle synthesis in pulsed hot gas stream

Powders tailored to customers' needs

Apptec is a powder technology developed by Glatt Ingenieurtechnik that allows powder composition and particle design to be adjusted to meet a customer's specific application needs. By synthesising the powder in a pulsed hot gas stream, product structures can now be generated that were not accessible with conventional techniques.



With Apptec powders are produced that are customised to meet the needs of particular applications

Obtaining powders that offer a particular functionality but that can also be reliably produced by manufacturers is not always easy. Powder processors want products with more or less unique properties, while manufacturers, in contrast, are following the trend towards greater standardisation so as to improve profit margins. This is where Glatt Ingenieurtechnik got involved in an effort to extend the existing powder production value chain. Dr. Lars Leidolph, Head of Advanced Powder Processing at Glatt Ingenieurtechnik, explains: "With our Apptec technology we can offer customers powders where the composition and particle design have been tailored in accordance with customer wishes to meet specific application requirements." The acronym Apptec stands for Advanced Pulse Powder Technology. Yet the abbreviation "app" is of course also synonymous with "application" – and the new powder production technology

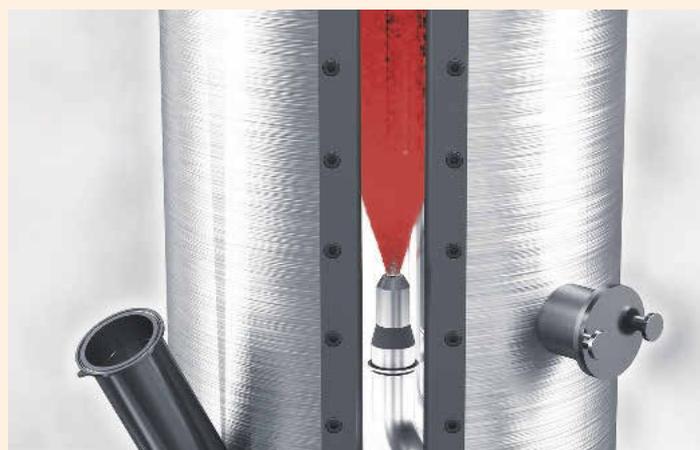
aims to produce powders that are customised to meet the needs of particular applications. The results are new types of powders with designed properties. The potential applications range from catalysts, pigments and other fine

The powder is synthesised in a controlled pulsed hot gas stream

chemicals to high-tech ceramics and functional foods. These powders are not mass-produced materials, however; they are speciality products that are difficult to obtain from established powder manufacturers. The technology is actually based on the well-established process of spray pyrolysis. The precursor, which may be a powder, solution or suspension, is sprayed into a hot gas stream where it is heated and undergoes chemical or mineralogical reaction, during which changes occur to its particle structure, morphology and size.

Pulsed hot gas stream

The features that define the performance of the end product can all be controlled in a single stage of the Apptec process. Carefully controlling the pulsing of the hot gas stream in the reactor is one of the key means of adjusting the properties of the product powder. The pulse frequency and amplitude can be varied, as can the process temperature and the flow velocity that determines the residence time in the reactor. Heat transfer from the hot gas to the particle is also improved in the pulsed stream environment. Compared to continuous gas streams, the heat transfer in pulsed streams is between five and ten times higher. This means that the particles heat up extremely quickly. Substances that tend to crystallise in conventional powder production processes, can, if desired, be produced as amorphous structures, which results in a significant increase in their catalytic activity. Reactions can likewise be controlled much more precisely. This enables pigments with highly complex stoichiometries to be manufactured, something that would be impossible with other powder production methods. Rapid heating creates unique thermodynamic reaction conditions that allow the formation of highly specific chemical compositions. A





All of the features that define a new powder product and how it performs can be carefully adjusted in the Apptec plant

further control parameter is the chemical make-up of the gas atmosphere, which can be adjusted to be either oxidising or oxygen-free.

No temperature gradients

The temperature and velocity gradients that are typical in conventional systems are absent in the pulsed gas reactor due to the high degree of turbulence in the pulsed system. The particles in this system are therefore all processed identically, at the same temperature and with the same residence time – and this time can be precisely set depending on product requirements. The resulting powder could not be more homogeneous. The new technology from Glatt does not suffer from particle aggregation problems, as the partial melting that can cause aggregation is not an issue thanks to the uniform and precisely controlled process temperature. At the end of the process, the particles undergo rapid cooling.

“There are of course certain limits to what we can achieve with our new process”, says Leidolph. Yet he has every confidence in the new technology given the encouraging results from the thorough testing campaign that was carried out at Glatt’s own technology centre: “We can tailor the powders we make so that they precisely match both customer specifications and application conditions and we can even combine a number of very different process steps, such as drying, calcination, particle formation or particle coating.”

R&D team offers particle design service

Glatt also offers an extensive R&D service to companies interested in using the new technology. The powder experts at Glatt’s technology centre in Weimar work together with customers to find the right particle design. It’s a process that can be both complex and time-consuming. Innovative powders will typically require at least a year of development work before the powder can go into production, as the customer will also need time to run application trials to test a powder with novel properties. Testing campaigns may additionally have to be conducted by the customer’s clients, for example when a catalyst manufacturer plans to integrate the powder into a matrix as a reactive material and is obliged to provide certification for the product. Finally, the catalyst is purchased by the end user, who in turn may have to subject it to product qualification procedures.

All in all, a lengthy process and one where Glatt can also offer short or long-term support as a contract manufacturer when a powder manufacturer or processor does not want to invest in their own Apptec plant. “We have built up sufficient production capacity for us to reliably supply a range of speciality products that our customers need”, explains Leidolph. Customers can of course order their own Apptec facility or can have it installed at a supplier of their choice. Companies purchasing their own plant benefit from the fact that



Dr. Lars Leidolph, Head of Advanced Powder Processing at Glatt Ingenieurtechnik: “Our Apptec technology allows us to offer our customers powders that are precisely tailored to meet their specific demands.”

test results can be applied directly in production without the need for a complex scale-up phase. While their own plant is being planned and built, these customers can make use of Glatt’s contract manufacturing services, allowing them to start supplying or processing the new powder, with any necessary processing steps such as granulation ideally carried out using equipment from Glatt.

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