Extended Abstract Polymer Sciences 2020
Vol.6 No.1

Euro Green Chemistry-2018-Powering Green Chemistry with Microspheres and Microcapsules-Christian Augustin-Helmut Schmidt University

Christian Augustin

Helmut Schmidt University, Germany

Introduction:

The world of today requirements and uses large amount of energy. As second and third world countries up and first world countries get better their level of life, a slowing of energy consumption cannot be seen, in spite of the hard work for energy conservation. Fossil energies as gas and oil have an even rising importance, in spite of their environmental drawbacks. Nuclear energy – even though that some countries as Germany try to replace it with renewable energies – plays till now an important factor, not only because of the low costs and a carbon dioxide free operation, but also for novel applications as the demolition of nuclear waste. Renewable energies are widely used and developed strongly and will play a crucial role in the future. Even solar technology, were recent price fall and loss of subsidiaries forced many companies out of business, is not dead and is still used in an rising number of installations. Increasing no of applications for biofuel and novel processes are on their way replacing fossil fuels by using electricity during low usage times from renewable sources such as off shore wind turbines and simultaneously harvest carbon dioxide.

Besides energy linked applications, also in various fields such as agricultural and farming novel technologies are very much sought for. For example the substitute of chemical fertilizers with natural ones, that are produced from sustainable materials, is a main research focus of the EU. In husbandry it is more important and preferred to remove pharmacological treatment of animals with e.g. antibiotics and replace it by the usage of natural materials such as plant extracts and probiotics. Lastly, the substitute of harvested feed with vegetable sourced feed, such as the alternate of fish in a salmon diet with plant derived products, are main challenges at this time to enhance the total food production for the always hungry world.

The huge number of those applications has one thing in common: In many of them Microspheres or Microcapsules are used. They are used in a lot of different forms, ranging from feed capsules, pharmacological active capsules, encapsulated cells and microbes, catalysts and catalyst carriers, filter materials, encapsulate chemicals in self-healing coatings over ceramics for high temperature insulating material in shale oil and gas improvement, right to being the energy source itself in the form of nuclear fuel or solar cells.

In many of the fields, granules are used for a significant amount of time with purposes as dosing, transport, and handling and of course release control. However, granules formed with conventional processes as spray drying/cooling, extrusion or dripping have a number of drawbacks. These are for example big size distribution, not easy control over produced sizes, deformed shape, low density, onion shell type of structure, difficult scale up or cost of processing. All these troubles can be overcome with a versatile and cost efficient process producing particles of highly spherical shape out of almost any thinkable material.

BRACE Microsphere and Microcapsule processes:

The BRACE-process for generating Microspheres and Microcapsules are normally laminar flow breakup method with vibrating nozzles. As opposed to other such processes as rotating disc or rotating cylinder laminar flow disintegrate processes, the setup is relatively simple, robust, easy to maintain as well as space and energy saving. In addition, the vibration offers a lot better control over the grain size as uncontrolled laminar flow breakup processes.

Ceramic applications:

Ceramics are used in various applications. For example heavily sintered ceramics such as Al_2O_3, ZrO_2, HfO_2 or mixtures are used as grind material to prepare well powders that are used then in other fields or methods. While there are more ways to produce grinding balls, the BRACE processes offer an outstanding low energy approach, to get high yield, high dense, monomodal size distributed grinding balls. This increases the grinding yield, lowers energy costs both for production and usage as well as reduces waste and additives use in the process.

More complicated processes use catalyst carriers, filter materials and even hollow ceramic spheres to increase reactions, filter efficiently materials from liquids and gases, use them as porous carrier for fluid bed reactions or even as insulation materials.

Food and Feed Applications:

As substitute of Antibiotics increasing number of products create usage of plant extracts, such as extracts from herbs that have same properties as antibiotics. Such oils are however highly volatile, create to activate allergic reactions and spoil the mucus layer in the stomach. To decrease and remove those effects, these materials are encapsulated in enteric formulations, making them easily available where effective. Those capsules are used in feed additives, as anti-diarrhea formulations for companion animals, as additives for meat producing animals like cattle, pig or poultry. In food applications such capsules and spheres are used as nutrients to carry such important dietary providers as fish oils, vitamins or minerals. For encapsulation of those actives as well as for e.g. probiotics for nutrient, supply and pharmacological applications, natural and sustainable polymers are used. This offers a full “green” product, without the required of using artificial materials in processing.

This work is partly presented at 9th World Congress on Green Chemistry and Technology, September 17-19, 2018, Amsterdam, Netherlands

Conclusion:

These applications are a small selection of uses of the BRACE Microspheres and Microcapsule processes that propose to reduce energy and resources to build enhanced products and processes. BRACE offers formulation and product development, contract manufacturing and machinery and equipment, from desktop to huge scale facilities of 20 t/h and more, to its customers, to provide for tomorrow.

The benefits that the Microspheres and Microcapsules, with their outstanding sphericity, monomodal and tight size distribution and little energy processes offer, render the presented processes the first choice for any present technology.

This work is partly presented at 9th World Congress on Green Chemistry and Technology, September 17-19, 2018, Amsterdam, Netherlands