Industrial scale microwave-assisted production of nanoparticles

Cristina Leonelli, Paolo Veronesi

Department of Materials and Environmental Engineering, University of Modena and Reggio Emilia, Modena, Italy

e-mail: cristina.leonelli@unimore.it

Achieving a narrow temperature distribution in the reaction volume contributes to reaction selectivity or, in case of nucleation and growth processes, to control particle size [1]. The possibility of volumetrically heat the reaction volume by means of microwaves can originate a temperature distribution completely different from a conventionally heated reaction volume. Many researchers identified this difference in the presence of "hot spots" which locally enhance or promote some selected reactions or transformations.

In case of nucleation and growth of nanoparticels (microwave hydrothermal synthesis), the narrow temperature distribution obtained by simulation can justify why nanoparticles are formed, having a narrower particle size distribution with respect to conventionally heated synthetic routes [2]. The large scale production of nanoparticles requires the development of microwave reactors which can reflect the laboratory temperature profile homogeneity.

It will be presented a new dedicated continuous-flow reactor, made of two twin prismatic applicators for a microwave-assisted process in aqueous solution. The reactor can produce up to 1000 liters/day of nanoparticles colloidal suspension at ambient pressure and relatively low temperature hence conducted using a "green chemistry" approach.

References

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