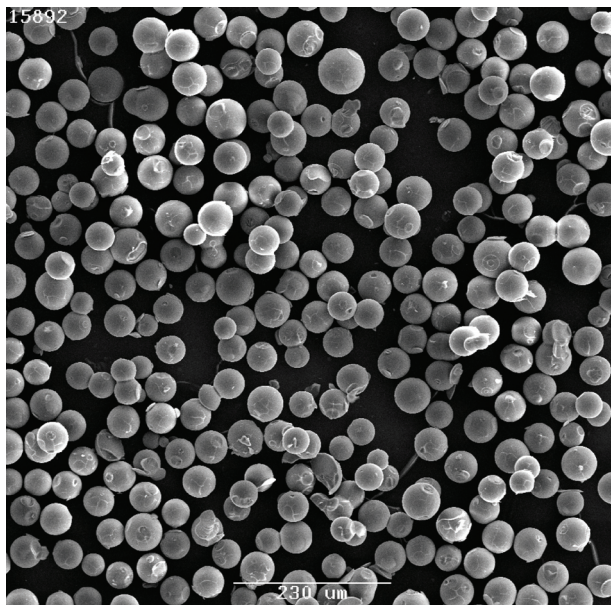


### MICRO-ENCAPSULATION AND CONTROLLED RELEASE

An increasing number of applications require the production of delivery systems in particulate form as well as close control over the release rate of active ingredients. CeramiSphere's technology offers both an easy encapsulation in ceramic particles as well as an adjustable release rate. The particle size can be varied through a close control of the emulsion chemistry. Independently, the release rate is controlled by tailoring the internal particle structure during the encapsulation. In addition the ceramic matrix provides enhanced chemical and mechanical protection of the active payload. The particles are biocompatible and benign to the environment.



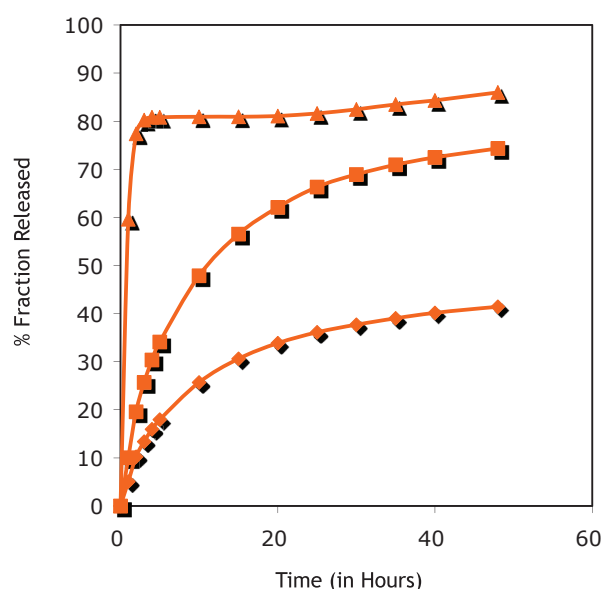
### KEY ADVANTAGES OF CERAMISPHERE™

#### MICRO-ENCAPSULATION SYSTEM

- Controlled particle size (from 1 to 100 μm)
- Tailored release rate (from hours to months)
- Protection of the active from its environment until release
- Physical protection by the ceramic matrix
- Mechanical resistance of the particles during processing and use
- Biocompatibility of the matrix
- Benign to the environment

### CONTROLLED RELEASE FROM CERAMISPHERE™ PARTICLES

Small hydrophilic molecules can be easily encapsulated at room temperature using CeramiSphere™ technology. Their subsequent release is controlled by the internal structure of the microparticles. By controlling the initial sol-gel chemistry, the porosity and tortuosity of the ceramic matrix can be adjusted to restrict the diffusion of the actives to the desired rate of release.



*Release of orange II dye from particles of identical size but with different internal structures.*

### APPLICATIONS

- Oral drug delivery
- Encapsulation of biocides and pesticides
- Subcutaneous and intra-muscular delivery of analgesics
- Arterial and intra-tumoral delivery of anticancer agents
- Incorporation in coatings (antifungal, antimicrobial and antifouling)
- Controlled release of specialty chemicals
- Wound healing