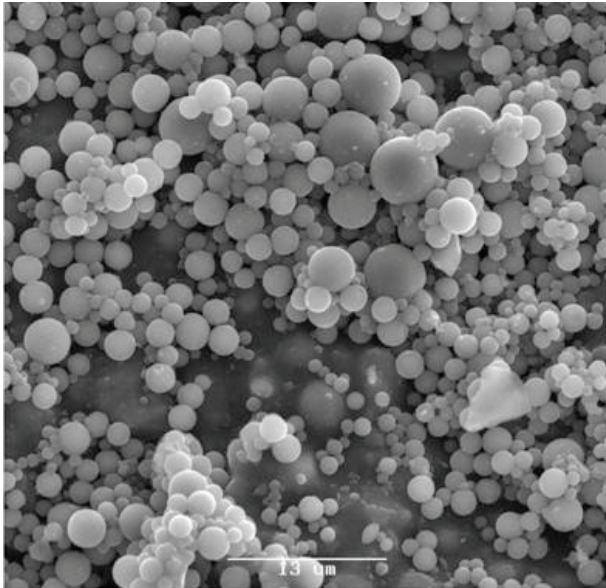


## CONTROLLED RELEASE OF BIOMOLECULES

A successful biomolecule release system must be capable of delivering biomolecules at a desired rate, as well as preserving the activity of the biomolecule throughout encapsulation, storage and release processes. CeramiSphere™ has developed an innovative procedure by which biomolecules are entrapped in silica microspheres formed from neutral, inorganic suspensions of aqueous silica colloids. The release mechanism is diffusion of the biomolecule through the matrix pores. The particles are in the range of 0.5 - 10 micron in size, with pore size being optimised (3-9 nm) for the biomolecule of interest.



*Microspheres designed for biomolecule release (size bar = 13 micron)*

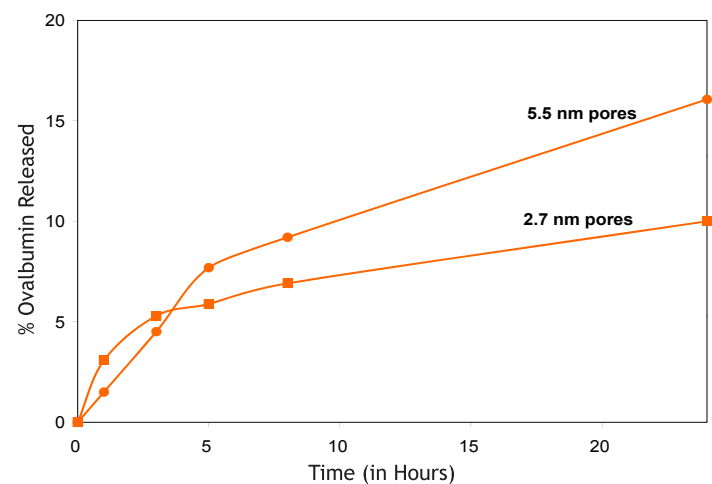
## KEY ADVANTAGES OF CERAMISPHERE™ BIOMOLECULE RELEASE SYSTEM

- Controlled particle size and release rate
- Synthesis is 'biomolecule friendly'
- All synthesis conducted at ambient temperature
- Inert ceramic carrier - will not react with solvents/chemicals to which polymers are susceptible. Stable in even strong acid conditions (e.g. stomach)
- Silica is intrinsically biocompatible
- Carrier has an hydrophilic surface and quasi-aqueous environment

- Cheap ingredients - commercially available in industrial quantities
- Low capital investment

## CONTROLLED RELEASE OF PROTEINS

A model protein, ovalbumin (45 kDa), encapsulated in two different pore size (2.7 and 5.5 nm) silica particles, shows no 'burst release' into phosphate buffered saline at 37 °C. The larger pore size results in more protein released after one day.



## APPLICATIONS

- Pharmaceutical delivery - e.g. vaccine adjuvants
- Biotech - e.g. controlled release of industrial enzymes, detergents, starch hydrolysis/fructose production, fruit juice manufacture, brewing, textiles, animal feed, baking, pulp and paper production, leather industry and food production (e.g. cheese)
- Specialised use of enzymes - e.g. biosensors, analytics
- Personal care products - e.g. toothpaste, contact lens cleaning
- Home care - e.g. laundry detergents
- Fine chemical production - e.g. chirally pure amino acids, rare sugars, semisynthetic penicillins and DNA-technology
- Cosmetics
- Food, nutraceuticals
- Veterinary applications