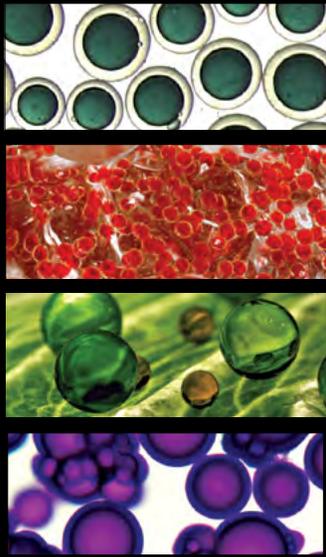


A white circular area containing several microcapsules of various colors (red, green, blue, purple, yellow) and sizes, arranged in a loose pattern. The background of the entire image is a dense field of similar microcapsules in various colors (blue, green, red, purple, yellow) and sizes, creating a textured, multi-colored effect.

# **MICRO/NANO** **encapsulation**

SOUTHWEST RESEARCH INSTITUTE®



## Southwest Research Institute

Founded in 1947 as an independent, nonprofit research and development organization, Southwest Research Institute provides a significant research, engineering and testing resource for industry, business and government. The Institute uses a multidisciplinary, integrated approach to solving complex problems in science and applied technology. As part of a long-held tradition, patent rights arising from sponsored research at the Institute are often assigned to the client. SwRI generally retains the right to Institute-funded advancements.

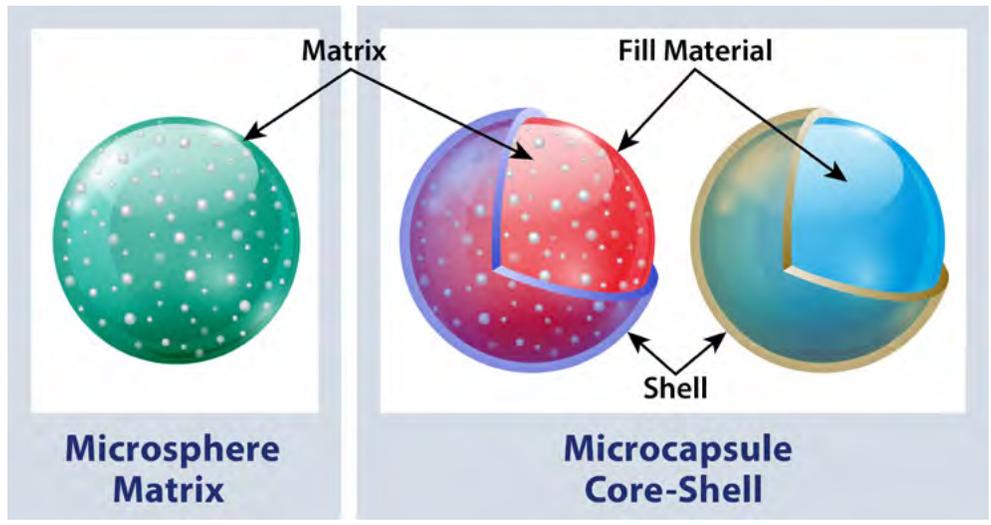
SwRI maintains Controlled Substance Registrations with the Drug Enforcement Administration permitting the Institute to handle controlled substances for the business activity of research and manufacturing.

©2021 Southwest Research Institute. All rights reserved.

Southwest Research Institute and SwRI are registered trademarks in the U.S. Patent and Trademark Office.

# encapsulation

For more than 70 years, Southwest Research Institute® (SwRI®) has been a leader in encapsulation. SwRI has conducted thousands of encapsulation, micronization, and particle engineering projects for numerous clients, spanning a wide variety of application areas. Institute personnel are experienced with over two dozen encapsulation techniques to produce capsules and particles with sizes from tens of nanometers to several millimeters. The encapsulation technique and formulation selected are based on the needs of the specific application to assist with solving product stability, control release, or other challenges for clients in both academia and industry.



**Microsphere Matrix**

**Microcapsule Core-Shell**

# facilities

### Facilities

- cGMP facilities
- FDA-inspected
- ISO 9001:2015
- DEA registered
- Potent material handling
- BSL 1 & 2 labs



### Sizes

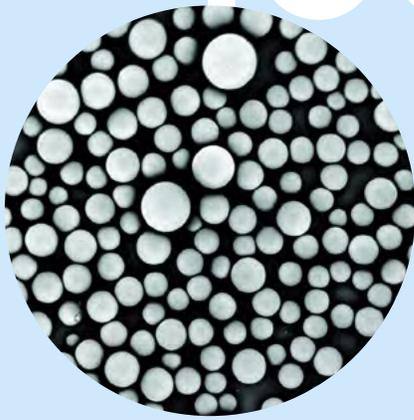
Nanometers to millimeters

### Scale

- Lab to pilot
- Milligrams to kilograms



# techniques



## Emulsions

- Monodisperse
- Coacervation
- Interfacial polymerization
- Solvent extraction/evaporation



## Atomization

- Monodisperse
- Spray drying
- Spinning disc
- Inert, electrostatic, solvents, melts

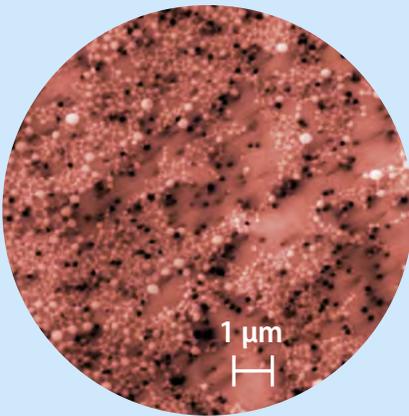


## Spray Coating

- Fluid bed
- Pan coating
- Inert, solvents, melts

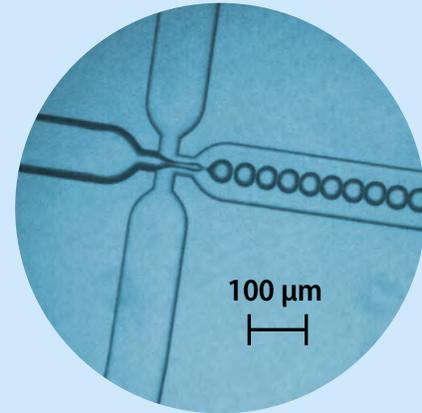
## Coextrusion

- Vibratory nozzles
- Microfluidic chips
- custom systems



## Nanoencapsulation

- Liposomes
- SLNs, LNPs
- Polymeric NPs
- Micelles
- Cyclodextrins



## Product Characterization

- Extensive biological, chemical & physical analysis tools
- Release testing
- Stability testing



## Applications

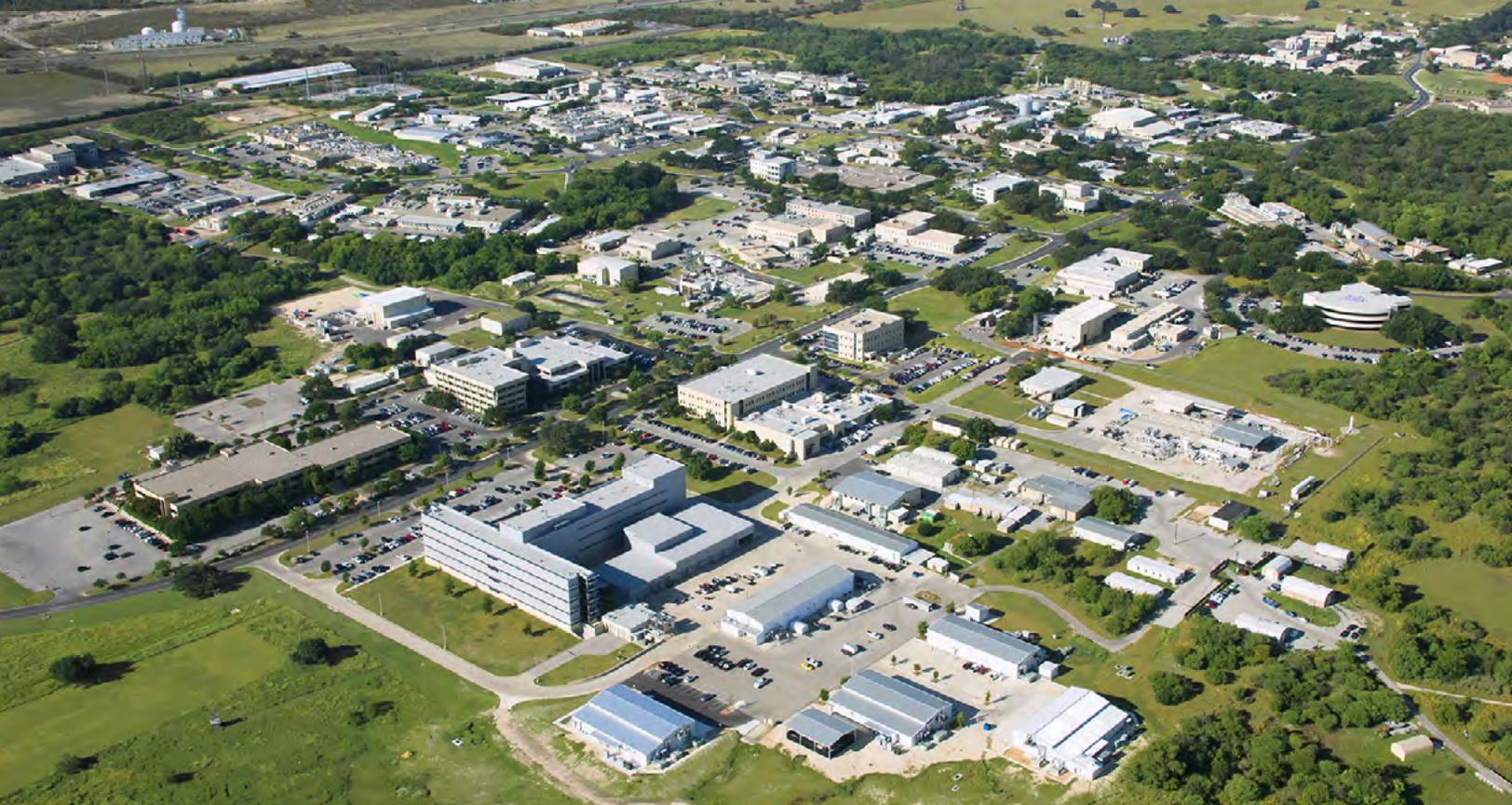
- Pharmaceuticals
- Nutraceuticals
- Food
- Consumer products
- Paints & coatings
- Agricultural

## Other Capabilities

- Hot melt extrusion
- Milling
- Synthesis
- Molecular modeling
- Finished dosage forms
- Cell cultures



# applications



*Southwest Research Institute is a premier independent, nonprofit research and development organization with nine technical divisions using multidisciplinary services to provide solutions to some of the world's most challenging scientific and engineering problems. Headquartered in San Antonio, Texas, the Institute occupies 1,500 acres and provides more than 2.3 million square feet of laboratories, test facilities, workshops and offices for more than 2,600 employees who perform contract work for industry and government clients.*



Benefiting government, industry and  
the public through innovative  
science and technology

[microencapsulation.swri.org](http://microencapsulation.swri.org)  
[swri.org](http://swri.org)



Quality System  
Registered to  
ISO 9001:2015

**Quality Certification — Chemistry and Chemical Engineering Division**

*The Chemistry and Chemical Engineering Division of Southwest Research Institute has achieved certification to ISO 9001:2015, an internationally recognized quality standard.*

**We welcome your inquiries.**

**For additional information, please contact:**

Joseph T. Persyn, Manager  
210.522.2691  
[joseph.persyn@swri.org](mailto:joseph.persyn@swri.org)

James D. Oxley, Ph.D., Staff Scientist  
210.522.2913  
[james.oxley@swri.org](mailto:james.oxley@swri.org)

Pharmaceuticals and Bioengineering Department  
Chemistry and Chemical Engineering Division

Southwest Research Institute  
6220 Culebra Road  
San Antonio, Texas 78238-5166

SwRI Business Inquiries • 210.522.2122 • [ask@swri.org](mailto:ask@swri.org)