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Product: Drug Delivery Simulation Software

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health
Larta Institute
National Institutes of Health Commercialization Assistance Program (NIH-CAP)

Therapeutic Ultrasound Contrast Agent Dynamics Modeling

Company Profile

Industry Sector: Research Tools- R&D, technology commercialization, and consulting in fluid dynamics and applied sciences

Company Overview: Founded in 1988, DYNAFLOW, INC.® provides quality research and development services, testing, and products in fluid dynamics and material sciences. As a leader in the fields of gas liquid interface dynamics, bubble dynamics, cavitation, fluid structure interaction, and erosion dynamics, DYNAFLOW offers services and products for the naval and marine, automotive, energy, chemical, environmental, and food and agriculture industries. DYNAFLOW pursues an inter-disciplinary approach to problems and has strategic collaborations with federal laboratories, commercial enterprises, and universities.

Target Market(s): Pharmaceutical and biotechnology company research departments; government and nonprofit pharmaceutical research organizations; CROs; universities; and pharmaceutical research software companies such as SAS and IBM.

Key Value Drivers

Technology*: We are combining our extensive experience in fluid dynamics and material science to offer a software package customized for modeling the behavior of ultrasound contrast agents and drug encapsulated delivery microbubbles in biological systems. Our software will help developers identify and optimize shell materials and understand the effects of shell properties on drug targeting, contrast agent dynamics, and intentional and unintentional shell breakup in response to directed ultrasound. This will help reduce pharmaceutical efforts required to optimize materials and procedures.

Competitive Advantage: Our software employs sophisticated numerical models which couple fluid and structure codes to allow the user to simulate the dynamics of encapsulated bubbles under realistic scenarios such as interactions with other agents, blood cells and/or vessel walls when excited by ultrasonic acoustic waves. The software can accurately capture the non-spherical dynamics of the shell breakup, which are different under biologically realistic scenarios than when the agent is isolated.

Plan & Strategy: We anticipate working with one or more strategic partners to bring the product to market. Customers will use the product under sale and license agreements.

**Technology funded by the NCRR and being commercialized under the NIH-CAP*

Management

Leadership:

Georges Chahine, Ph.D., President and CEO
DYNAFLOW founder, over 30 years of involvement in advanced scientific research and R&D and business management. Recognized authority in bubble dynamics and hydrodynamics

Chao-Tsung Hsiao, Ph.D., Principal Research Scientist
DYNAFLOW, Director Modeling & Simulation Department, 12 years experience in advanced scientific research and technical management.

Jin-Keun Choi, Ph.D., Principal Research Scientist
DYNAFLOW, Director Products & Testing Department, 15 years experience in scientific and engineering studies and technical management.

Product Development

DYNAFLOW has four product platforms:

- **3DYNAFS®** – a software suite for simulating free surface dynamics, cavitation, bubbly flows, and encapsulated microbubbles;
- **ABS ACOUSTIC BUBBLE SPECTROMETER®**- instrumentation and software to measure bubble-size distributions, flows, and void fractions in gas and liquid mixtures;
- **DYNAJETS®** - specialized nozzle systems that produce cavitation and have applications in cleaning, cutting, erosion testing, oxidation, biofuel production, and environmental remediation;
- **DYNAPERM®** - a particle filtration system capable of flux rates thirty fold higher than conventional cross flow filtration systems.

The **3DYNAFS-CELL®** module extends the **3DYNAFS®** modeling software to diagnostic and drug delivery applications involving ultrasound, contrast agents, and drug encapsulated microbubbles as drug delivery agents.