

## Reactive NanoTechnologies Inc.: Temperature-controlled Precision Bonding



### THE LLNL TECHNOLOGY

A multilayer reactive foil that controls the instantaneous release of heat energy that occurs in joining processes. After initial development at LLNL, the licensee, Reactive NanoTechnologies (RNT) continued to refine the process. The technology has earned numerous prestigious awards.

### COMPANY

RNT, headquartered in Hunt Valley, Maryland, was founded in 2001. The company develops and manufactures NanoFoil® and has more recently developed its patented NanoBond®. RNT has an exclusive license from LLNL.

### PRODUCT

NanoFoil® and NanoBond® are unique nanotechnology products. One use is in computer and semiconductor design where heat buildup is a critical issue. The difficulty of conducting the heat out of a chip limits performance and reliability. The most effective way would be to attach the chip package to a heat sink with a conductive metallic bond such as a solder. But the heat from soldering can damage or destroy the chip. NanoFoil® delivers just enough heat to melt the solder but not enough to damage the chip. NanoFoil® can bond metals, ceramics, semiconductors, and polymers on small assemblies or large industrial equipment. It can even bond dramatically dissimilar materials without causing the materials to crack. RNT has commercial licenses with many Fortune 500 companies.

### IMPACT

NanofoilR and NanoBond® can replace conventional soldering or brazing operations, which can involve toxic materials and high temperatures. They can also replace laser and resistive welding, which were developed to get around the limitations of traditional soldering and brazing but have significant up-front capital costs.



“Based on the strength of the IP developed at LLNL, Reactive NanoTechnologies has been able to raise more than \$25 M in venture financing and is continuing to build a strong and successful company intent on establishing NanoFoil and NanoBond as the platform bonding technology for industries such as thin film vacuum deposition, aerospace, automotive and microelectronics”

Joseph A. Grzyb  
CEO

