

Ball Aerospace Demonstrates First Optical Refrigerator

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Ball Aerospace & Technologies Corp. has achieved a breakthrough in solid state cooling by demonstrating the first optical refrigerator. The demonstration shows for the first time, that a device other than fluorescent material can be cooled while fluorescence is occurring.

Ball Aerospace engineers used laser light and a process called anti-Stokes fluorescence to cool a one centimeter diameter aluminum cylinder, simulating the detector in an infrared camera or other small device, 11.8 degrees centigrade below the surrounding temperature.

"We provided a solution to the problem of thermally coupling an object to the fluorescent cooling element while reducing fluorescent light absorption," said Program Manager, Gary Mills. "This allows an object to be cooled by conduction to the cooling element instead of heated by absorbed light."

Benefits of the refrigerator include its small size, long life, zero vibration, low-electromagnetic interference and low-cost potential. Because of the physics of the cooling process, the Ball Aerospace optical refrigerator also has the potential to operate at cryogenic temperatures. Optical cryocooling of sensors is expected to have an advantage over mechanical coolers in vibration, ruggedness, cooler mass, electromagnetic interference and magnetic field. Optical cryocoolers are also expected to have an advantage over thermoelectric (Peltier) coolers in minimum operating temperature, magnetic field immunity and design ruggedness.

Mills and his co-authors provided details of their refrigerator's design and operation in a paper presented at the September Cryogenic Engineering Conference in Anchorage, Alaska.

This work is supported by a contract from the NASA Earth Science Technology Office.

Ball Corporation is one of the world's leading suppliers of metal and plastic packaging to the beverage and food industries. The company also owns Ball Aerospace & Technologies Corp. With the addition of Ball Packaging Europe, acquired in December 2002, Ball expects to report 2003 sales of approximately \$5 billion, of which approximately \$4.5 billion will come from its two packaging segments and \$500 million from its aerospace and technologies segment.

Forward-Looking Statements

The information in this news release contains "forward-looking" statements. Actual results or outcomes may differ materially from those expressed or implied. As time passes, the relevance and accuracy of forward-looking statements contained in this release may change. The company currently does not intend to update any particular forward-looking statement except as it deems necessary at quarterly or annual release of earnings. Please refer to the Form 10-Q filed by Ball Corporation on August 12, 2003, for a summary of key risk factors that could affect actual results or outcomes. Factors that might affect the packaging segments of the company are: fluctuation in consumer and customer demand; competitive packaging material availability, pricing and substitution; the weather; fruit, vegetable and fishing yields; company and industry productive capacity and competitive activity; lack of productivity improvement or production cost reductions; regulatory action or laws, including the German mandatory deposit or other restrictive packaging laws and environmental and workplace safety regulations; availability and cost of raw materials, energy and transportation; the ability or inability to pass on to customers changes in these costs, particularly resin, steel and aluminum; pricing and ability or inability to sell scrap; international business risks (including foreign exchange rates and tax rates) particularly in the United States, Europe and in developing countries such as China and Brazil; and the effect of LIFO accounting on earnings. Factors that may affect the aerospace segment are: funding, authorization and availability of government contracts and the nature and continuation of those contracts; and technical uncertainty associated with aerospace segment contracts. Factors that could affect the company as a whole include those listed plus: successful and unsuccessful acquisitions, joint ventures or divestitures and the integration activities associated therewith including the integration and operation of the business of Schmalbach-Lubeca AG, now known as Ball Packaging Europe; the inability to purchase the company's common stock; insufficient or reduced cash flow; regulatory action or laws including those related to corporate governance and financial reporting, regulations and standards; actual and estimated business consolidation and investment costs and the net realizable value of assets associated with these activities; goodwill impairment; changes in generally accepted accounting principles or their interpretation; litigation; antitrust, intellectual property, consumer and other issues; strikes; boycotts; increases in various employee benefits and labor costs, specifically pension, medical and health care costs incurred in the countries in which Ball has operations; rates of return projected and earned on assets of the company's defined benefit retirement plans; interest rates and level of company debt, including floating rate debt; terrorist activities, war or catastrophic events that disrupt or impact production, supply or pricing of the company's goods and services, including raw materials and energy costs, or disrupt or impact the credit and financing of the company's businesses; and U.S. and foreign economic conditions.

SOURCE: Ball Aerospace & Technologies Corp.

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