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University of Colorado and ALD NanoSolutions, Inc., Win 2004 R&D™ 100 Award

BOULDER – Particle-ALD™, invented at the University of Colorado and developed by ALD NanoSolutions, Inc., has been selected by *R&D Magazine* as one of the 100 most technologically significant products introduced into the world marketplace over the past year.

The R&D 100 Awards, which the *Chicago Tribune* dubbed “The Oscars of Invention,” will be presented Oct. 14 at a banquet in Chicago. Nominations for the award include entries from prestigious companies, research organizations and universities around the world. The editors and staff of *R&D Magazine*, as well as 70 outside experts, participated in the judging.

Past R&D 100 Awards have recognized winning products with household names such as Polacolor film (1963), the flashcube (1965), the automated teller machine (1973), the halogen lamp (1974), the fax machine (1975), the liquid crystal display (1980), the printer (1986), the Kodak Photo CD (1991), the Nicoderm anti-smoking patch (1992), Taxol anticancer drug (1993), lab on a chip (1996) and HDTV (1998).

David Allen, associate vice president for technology transfer, said, “This prestigious award is a solid confirmation of the hard work conducted by this highly creative research team. Their work is indicative of the valuable intellectual property being created at CU and how research results are being transformed into products and services that better the human condition.”

CU has licensed intellectual property to ALD NanoSolutions, Inc., and work performed under NSF, DOE, and DOD Small Business Technology Transfer Research (STTR) awards helped validate the technology in CU labs.

The value proposition of Particle-ALD™ is based on the effect of the surface area in determining particle properties, according to scientific co-founders Professor Alan Weimer of CU-Boulder's Department of Chemical and Biological Engineering and Professor Steven George of CU-Boulder's Department of Chemistry and Biochemistry. For example, a simple metal iron particle with a diameter of 1 micron contains roughly 40 billion atoms. The outer surface of that particle exposes roughly 60 million atoms. This number of exposed surface atoms represents only 0.15 percent of the entire number of available atoms. If one reduces the size of that particle to 10 nanometers – a factor of one hundred – then 15 percent of the atoms of the particle are at the surface. For any given weight of metal particles, the difference in reactivity between particles that are 1 micron and 10 nanometers in diameter becomes enormous because of the important effect of the surface area. This difference leads to a completely different set of interactions, reactions and properties from the exact same material.

Dr. Karen Buechler, President of ALD NanoSolutions, added that to take advantage of this order of magnitude increase in relative surface area, Particle-ALD™ technology is required to control surface chemistry at a nanoscale. Particle-ALD™ allows conformal, pinhole-free, nanothick films that are controlled to within a few angstroms thickness to be chemically bonded to individual primary substrate particle surfaces. By placing a nanothick protective film such as alumina or silica onto the surface of primary nanosized cobalt and iron particles, maintaining the strong magnetic moments of these particles that would otherwise be lost during surface oxidation is possible. Such novel materials would have significant application in medical diagnostics, defense, and drug delivery industries, among others. Oxidation-resistant, ultra-high thermally conductive nanosized copper or aluminum substrate particles that are electrically insulated can be fabricated in a similar manner and used as thermal fillers to improve heat removal for plastic based microelectronics applications.

As the surface chemistry is developed, new conducting and catalytic particles can be made by placing nanothick films of silver, gold or platinum metals onto the surface of inexpensive nanosized oxide particles in order to achieve the ultrahigh surface area effect of nanometals without producing the expensive nanometal in the bulk. Such a development would provide for the widespread utilization of cost effective hydrogen fuel

cell technology today.

Viewing this technology from a commercialization perspective, Mike Masterson, CEO of ALD NanoSolutions, suggested that the nanotechnology challenge isn't about manufacturing smaller particles. The gateway to the future is through the ability to innovate at the surface level where particles interact with the surrounding environment. Particle-ALD™ as an enabling technology is the gate, potentially providing for the control of ultra-fine particle chemical, electrical, optical, magnetic, physical and other surface properties.

ALD NanoSolutions, Inc., was founded in 2001 by P. Michael Masterson, Dr. Karen Buechler and University of Colorado Professors Dr. Steven George and Dr. Alan Weimer. The company's proprietary technology is based on atomic layer deposition (ALD) coating chemistry and processing methods developed by George and Weimer for depositing ultra-thin films on particulate surfaces. The company is focused on commercializing its nano-coating processes on particles and polymers, called Particle-ALD™ and Polymer-ALD™, and is targeting collaborative research agreements with domain partners for the discovery and validation of innovative composite materials in selected industries. For further information please visit www.ALDNanoSolutions.com.

The University of Colorado is a three-campus system with campuses in Boulder, Colorado Springs, Denver and at the former Fitzsimons Army Base in Aurora. The CU Technology Transfer Office pursues, protects, packages, and licenses to business the intellectual property generated from the university-based research enterprise and serves faculty, staff, and students seeking to create such intellectual property. For more information on CU's technology transfer services go to www.cu.edu/techtransfer. For further information, please contact Michele McKinney in the CU System Office of Institutional Relations at (303) 492-6206.