Joseph M. DeSimone

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Dr. Joseph M. DeSimone is the CEO/Co-founder of Carbon, Inc. located in Silicon Valley. Prior to this, DeSimone was the Chancellor's Eminent Professor of Chemistry at the University of North Carolina at Chapel Hill, and William R. Kenan, Jr. Distinguished Professor of Chemical Engineering at North Carolina State University and of Chemistry at UNC. DeSimone has published over 300 scientific articles and has over 150 issued patents in his name with over 200 patents pending. In June, 2016 DeSimone was recognized by President Barack Obama with the National Medal of Technology and Innovation.

DeSimone is one of less than twenty individuals who have been elected to all three branches of the U.S. National Academies: National Academy of Medicine (2014), National Academy of Sciences (2012) and the National Academy of Engineering (2005). He is also a member of the American Academy of Arts and Sciences (2005). DeSimone has received over 50 major awards and recognitions including the inaugural $250,000 Kabiller Prize in Nanoscience and Nanomedicine; 2015 Dickson Prize from Carnegie Mellon University; 2014 Industrial Research Institute Medal; 2014 Kathryn C. Hach Award for Entrepreneurial Success; 2012 Walston Chubb Award for Innovation by Sigma Xi; 2010 AAAS Mentor Award in recognition of his efforts to advance diversity in the chemistry PhD workforce; 2009 NIH Director's Pioneer Award; 2009 North Carolina Award; 2008 $500,000 Lemelson-MIT Prize for Invention and Innovation; 2002 John Scott Award presented by the City Trusts, Philadelphia, given to "the most deserving" men and women whose inventions have contributed in some outstanding way to the "comfort, welfare and happiness" of mankind; and 2002 Engineering Excellence Award by DuPont.

DeSimone is the co-founder of several companies including Micell Technologies, Bioabsorbable Vascular Solutions, Liquidia Technologies and Carbon. DeSimone received his B.S. in Chemistry in 1986 from Ursinus College in Collegeville, PA and his Ph.D. in Chemistry in 1990 from Virginia Tech. He currently resides in Monte Sereno, California with his wife of 30 years, Suzanne.

Abstract: Future Fabricated with Light: Continuous Liquid Interface Production to Drive Additive Manufacturing

Despite the increasing popularity of 3D printing, also known as additive manufacturing (AM), the technique has not developed beyond the realm of rapid prototyping. This confinement of the field can be attributed to the inherent flaws of layer-by-layer printing, and in particular, anisotropic mechanical properties that depend on print direction, visible by the stair-casing surface finish effect. Indeed "3D printing" is a misnomer: it is actually 2D printing over and over again. This lecture will describe a new advance in additive manufacturing that is rapid, continuous and no longer layer-by-layer that promises to advance industry beyond basic prototyping to 3D manufacturing. The new Continuous Liquid Interface Production technology (CLIP) harnesses light and oxygen to continuously grow objects from a pool of resin instead of printing them layer-by-layer. CLIP capitalizes on the fundamental principle of oxygen inhibited photopolymerization to generate a continual liquid-interface of uncured resin between the growing part and the exposure window. This interface eliminates the necessity of an iterative layer-by-layer process allowing for continuous production. CLIP technology raises the state-of-the-art in additive manufacturing in three ways:

- GAME-CHANGING SPEED: 25-100 times faster than conventional 3D printing
- COMMERCIAL QUALITY: produces objects with consistent mechanical properties
- MATERIAL CHOICE: enables a broad range of polymeric materials

Moreover, continuous production enables advantages including the fabrication of large overhangs without the use of supports, reduction of the stair-casing effect without compromising print time, and isotropic mechanical properties. Combined, these advantages result in multiple indicators of layerless and monolithic fabrication using CLIP technology.