

# Surface Engineering for Functionality – From Micro to Macro

Jian Cao

Cardiss Collins Professor of Mechanical Engineering  
Director, Northwestern Initiative on Manufacturing Science and Innovation  
Northwestern University  
cao.mech.northwestern.edu

## Abstract

I view manufacturing as an integration platform that translates ideas and resources into products used by societies. Current research efforts at our research center are rooted in advancing new flexible manufacturing processes using the combination of the mechanics-driven and data-driven approaches. In this talk, I will focus on the discovery of micro-scale phenomena in both additive and subtractive manufacturing processes that impact the functionality of a product at the macro-scale. Specifically, I will show how the integration of the fundamental process mechanics, process control, and techniques including machine learning and in-situ monitoring to achieve the desired functionalities, from mechanical properties to anti-fouling.

## Short Biography



Cardiss Collins Professor Jian Cao (MIT'95, MIT'92, SJTU'89) specialized in innovative manufacturing processes and systems, particularly in the areas of deformation-based processes and laser additive and subtractive manufacturing processes. She founded the university research center on Manufacturing Science and Innovation at Northwestern, known as NIMSI. She has co-authored over 230 journal articles, 20 patents, and op-ed articles. Cao is the Editor-in-Chief of *Journal of Materials Processing Technology*. Prof. Cao is an elected member of the National Academy of Engineering (NAE), a Fellow of

American Association for the Advancement of Science (AAAS), ASME, CIRP and SME. Her major awards include ASME Milton C. Shaw Manufacturing Research Medal, SME Gold Medal, DoD Vannevar Bush Faculty Fellowship, Charles Russ Richards Memorial Award from ASME and Pi Tau Sigma, SME Frederick W. Taylor Research Medal, ASME Blackall Machine Tool and Gage Award, and NSF CAREER Award. She served as President of the SME North America Manufacturing Research Institute, Chair of ASME Manufacturing Engineering Division, and Program Director at the National Science Foundation. She is a recipient of ASME Dedicated Service Award. Cao serves on the Board of Directors of SME and mHUB Board, nation's fastest growing hardtech innovation and manufacturing center.