Special issue on modeling and simulation of advanced manufacturing processes

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This special issue's objective was to explore and illustrate the development of cutting-edge modeling techniques and computational methods for advanced manufacturing processes. The special issue investigated nontraditional, scalable, manufacturing methods, exemplified by, for example, additive manufacturing processes. It is important to emphasize that we did not seek papers that simply apply well-established computational techniques and commercial codes to standard manufacturing processes. One of the primary objectives was to provide scientific and engineering foundations for many emerging new technologies that are being used or proposed to be used in industry. As we have witnessed over the last 20 years, many of the modern breakthroughs in science and technology are a result of the development of innovative research tools and new materials that can be processed and inexpensively manufactured rapidly, in large amounts, and in a "green" manner.

For example, in this special issue, 11 papers were collected, including meshless methods for contact problems in metal forming, predictive vibration control in cutting processes, multiphysical simulations in laser processing, adaptive contact solvers, 3-D topology optimization with X-FEM, coarse-graining of atomistic simulations in semiconductor design, particle-based methods for machining and magneto-electric composites. We strove to have the papers written in a self-contained manner, including some background aspects of a pedagogical/review nature. In many cases, this was needed since we wish to reach the larger Computational Mechanics community.

In summary, we hope that this special issue is of use to the computational mechanics and manufacturing communities, and in particular to young researchers in both fields.

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