



Sustainable Manufacturing of Composite Materials

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A B S T R A C T

The growing use of composite materials in aerospace, transportation, recreational products and renewable energy production manufacturing has created a critical need for low-cost sustainable manufacturing methods. The current methods of consolidation and cure are not compatible with the projected aircraft, automobile production rates, and the associated manufacturing costs and energy consumption are unacceptably high. Manufacture of composite parts involves multiple steps. First, multiple layers of dry or pre-impregnated reinforcements with thermoset or thermoplastic polymers are overlaid on a tool, then heated while pressure is applied to achieve gas removal, compaction, and cure. Often, a significant amount of raw material is wasted during the layup or preforming

process and during the final trimming of the part. Furthermore, if manufacturing defects are detected in the final component, additional costly repair operation or even the rejection of the part can significantly increase the overall manufacturing costs of composite parts. This webinar will present an overview of the research conducted towards the sustainable manufacturing of composite materials. The objective of the research is to develop new processes, material systems and design tools in order to reduce manufacturing costs and improve the environment impact of composite materials manufacturing. Possible solutions will be presented with concrete examples showing the reduction of waste of materials and energy.



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B I O

Prof. Hubert received a B. Eng. in Mechanical Engineering in 1988 from École Polytechnique de Montréal, an M.A. Sc. in Mechanical Engineering in 1991 from École Polytechnique de Montréal and a Ph.D. in Metals and Materials Engineering in 1996 from The University of British Columbia. Between his Masters and his Doctorate, he worked at Bombardier Transport as a design engineer. After his Doctorate, he worked at Forintek Canada as a research scientist from 1996 to 1999. He joined the Old Dominion University in 2000 as an Adjunct Professor where he conducted research on composite materials manufacturing for aerospace applications at NASA Langley Research Center in Hampton, Virginia.

Prof. Hubert joined the Department of Mechanical Engineering at McGill in 2002 as an Assistant Professor with a Canada Research Chair Tier II. He holds the Werner Graupe Chair in Sustainable Composite Manufacturing since 2014. He is the Director of a large strategic cluster (CREPEC) that regroup 70 researchers and over 500 graduate students working in the field of polymers and composites research. He has over 350 referred conference and journal publications in the field of composite materials. He planned and led large collaborative grants with companies like Bombardier, Boeing, Bell Helicopter, Pratt & Whitney, Airbus, Safran, Ford and over 20 SME's on the development of composite material processing and nanocomposites. He trained 11 Postdoctoral Fellows, 24 PhD and 49 MEng graduate students in the field of composite materials and initiated over 50 undergraduate students to research on advanced materials. He presented over 50 invited technical presentations in English and French at conferences, universities and companies on the subject of composites processing, nanocomposites and sustainability. He developed COMPRO, a finite element processing model for composite structures that was used by The Boeing Company to design the cure cycle of the Boeing 787 composite parts. He co-founded Convergent Manufacturing Technologies Inc., a spin-off from the Composites Group at The University of British Columbia that provides software and technical solutions to lower risk in composites manufacturing. He teaches and developed courses for the undergraduate and graduate curriculum in mechanical engineering and advanced composite manufacturing.

Prof. Hubert also has been very active with administrative duties at McGill and in leadership activities within his discipline. His main contribution at McGill is the leadership of the Master of Aerospace Program and the Minor in Aerospace Engineering in the Department of Mechanical Engineering. He is also a board member of the McGill Institute of Aerospace Engineering.