

Editorial

Advanced Manufacturing: Polymer & Composites Science – The First Issue

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Dear Authors and Readers,

It has been almost a year since we signed the editorial contracts and started our work with AMPCS. The journal has been fortunate from its very beginning, being run by the highly professional and dedicated team from Maney Publishing. Although we (the editors) live and work in countries separated by the oceans, we have never sensed our geographic distances, nor been hampered by our time zones during the creation of AMPCS. We have been positively surprised – and humbled – by the exceptional interest the journal has received; first as we welcomed the leading researchers from our worldwide community to the Editorial Board, and then as we received the manuscript submissions from the world's leading research groups to our very first issue.

The official launch of AMPCS (and *Nanocomposites*) took place at ECCM16 in Seville, on 25th June 2014, with over 70 invitees representing our composites research community at large. The event celebrated the new publishing bud that would serve our community's dissemination needs in the advanced composites manufacturing. At the same time we bid farewell to our father of composite materials, Professor Tony Kelly, who passed away at his home in Cambridge only three weeks before the conference. Professor Kelly made an enormous contribution to AMPCS by endorsing our journal's aim and scope with his lifetime scientific legacy. He developed a strong research interest in the environmental impact of composites in the later stages of his life and he worked on this topic until his last day. To preserve a part of his fruitful legacy, AMPCS will seek to publish as many environmental studies in composite materials as possible and we hope to become the main publishing portal for the applied life cycle analysis in composites manufacturing novel yet growing field of multidisciplinary research.

As this editorial is being written, most articles are still undergoing their production towards the completion of the first issue, with both editors and authors being kept on track by Ms Rose Worrell, the Managing Editor of the journal. The AMPCS thematic scope has been kept relatively flexible, with its core being rooted in the advanced and automated manufacturing challenges in structural polymer-based composites and multifunctional materials. The first issue reflects this by offering high quality publications from a wide range of new and existing advanced manufacturing techniques, introducing either radical step-changes in the fabrication of complex materials and structures, or significant advancements in the recently developed methodologies that may result in the improved cost and quality efficiency.

The first article published in this first issue of AMPCS presents multi-scale modelling of combined deterministic and stochastic fabric non-uniformity, for realistic resin injection simulation.¹ The study appears to be the crown of long-term scientific development in the complex challenge that brought together theoretical models from textile engineering, fluid mechanics and computational mechanics research fields.

Interestingly, the multidisciplinary nature of the science of advanced composites started with metallic alloys back in the '60s. Nowadays we can witness the fruit of five decades of theoretical research, embedded in the development of complex textile composites, being transferred back to the design and prediction of metal matrix composites. Although the scope of AMPCS considers only polymer matrix composites, such multidisciplinary papers will attract readership from the related research communities.

To our surprise, quite a few manuscripts submitted to AMPCS study the fundamentals of composites hand layup manufacturing², a method that has largely remained the same since inception and has been highly dependent on the individual's skills. Thanks to modern visual and analytical tools, the processes that have been considered *manual* can now be sequenced, optimised and integrated into a well controlled and traceable method of industrial *unification* that is applicable to the manufacturing practices world-wide. We would probably not err in the assumption that these papers will soon be used as the basis for new hand layup manuals in most composites workshops, still the only suitable manufacturing route for complex

high-value, low-volume parts in transport industries. Another particularly interesting paper is the study published on the manufacturing-induced defects on damage initiation³, which transfers the longest standing science in composite materials into the field of composites manufacturing.

The Therriault group focuses on the effectiveness of using an electric field for aligning multiwall carbon nanotubes in a polymer matrix as a novel fabrication method.⁴ This development addresses the major issue of using non-conductive carbon fibre composites in the aviation industry. A great majority of similar studies dwell on the materials properties and design of intricate and complex systems that are still far removed from the existing advanced manufacturing facilities. This paper, however, looks at an implementable solution that may lead to synergistic improvements in thermo-mechanical and physical properties of next generation composites.

Some readers may wander into this new edition looking for potential solutions in the manufacturing of multifunctional and complex shape composites. This aspect has been covered by a study introducing a liquid resin printing technique into stabilising textile preforms, offering a potentially new manufacturing route to introducing combinations of resins that may not be compatible through mixing techniques.⁵ The complex textile preform used in this study is featured on the journal's cover.

The article on the effect of machining coolants on the integrity of advanced carbon fibre composites contains conclusions immediately applicable to the current machining practices in composites.⁶ The science of composites machining is rather complex and considers the effects on the final resulting properties in composite components generated, on the fundamental level, as the result of high-strain rate cutting by a rigid tool body into a complex morphology of fibre/matrix/interface. This study is applicable to all similar systems and offers recommendations that can produce an immediate impact on the current industrial practices.

Dear *Researcher*, whether your background is from industry or academia, we remain confident that you will find useful scientific developments to serve your technical and research needs, both in this issue and the future AMPCS publications. AMPCS has been selected as the main publishing portal for ICMAC 2015, 10th International Conference on Manufacturing of Advanced Composites, 24-25 June 2015 (www.icmac2015.org). We look forward to reviewing the world-class advancements in composites manufacturing at this prestigious event.

We wish you a Happy New Year 2015.

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