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“Process Structuring of Polymers and Polymer Nanocomposites In Micromoulding”

Micromoulding involves highly constrained flow geometries and very short fill times, hence large stress, velocity and temperature gradients. This may lead to difficulties in filling mould cavities and replication – but may also provide opportunities for the attainment of product structures, and hence properties, which cannot be achieved in conventional injection moulding. This includes skin-core effects, crystalline distribution, and orientation distribution (matrix and/or filler) in micromoulded products. Currently micromoulding geometries are sufficiently large to ensure that continuum descriptions and effects apply, but small scale features and miniaturisation trends (and of course imposed surface features) are driving towards flows where this may not be the case. A range of results are brought together in the context of prospects for new structuring of polymer products. The key parameters in micromoulding processing will be discussed, including length scales, which most influence product morphology and hence property gradients, including experimental insights, and potential for control of morphology via processing.

BIOGRAPHY

Professor Phil Coates FREng is a Physics graduate (Imperial College), London; his PhD research was on solid phase deformation processing of polymers (Leeds University). He is Pro Vice Chancellor for Research & Knowledge Transfer, and Professor of Polymer Engineering at Bradford and Director of the internationally recognised Interdisciplinary Research Centre (IRC) in Polymer Science and Technology (across the Universities of Leeds, Bradford, Durham and Sheffield), with some 50 researchers at Bradford involved at the leading edge of in-process measurements for process monitoring, analysis and control, and computer modelling. He is also Director of the Advanced Materials Engineering RKT Centre, and the International Centre for Polymer Microprocessing (a joint laboratory with Sichuan University). His research targets high

value polymer products for a range of sectors – optical, healthcare technology (e.g. bioresorbable polymers for orthopaedic applications) pharmaceuticals processing, automotive & advanced materials developments, including nanocomposites and reactive grafting. His research has substantial support (over £24 million total grants and contracts) from UK Government sources and industry, with over 100 companies collaborating from the USA, Europe, the Middle East, Australia and Japan. The research involves strong academic cooperation in the UK, Europe, N America, Japan and China. He leads the new Science Bridges China project – a government sponsored collaboration (currently ~£3.4m total UK and China support) with 11 Chinese Universities focussed on innovation in healthcare technologies, with an open innovation platform. Prof Coates is a director of Medilink (Y&H) Ltd. He chairs the Leeds City Region (LCR) Innovation Task Group, and a member of the Economic Drivers & Innovation Panel. He received the Institute of Materials (IOM3) Netlon Gold Medal for Innovation in Polymer Processing (1999), the Plastics Industry Award for personal contribution to the industry in 2006, and the IOM3 Swinburne Award (2008). He is a member of the International Polymer Processing Society committee, and has organised a wide range of international conferences, and regularly gives invited, keynote and plenary lectures. He has published extensively - some 280 papers, in scientific journals and has co-authored 4 books, and edited 11 books. He is Chief Editor of the IoM3 international journal, *Plastics, Rubber and Composites: Macromolecular Engineering*. Prof Coates was elected a Fellow of the Royal Academy of Engineering in 1995. He is married, with four children and three grandchildren; in addition to family, his chief interests are in music, and computers.

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