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PII: S1359-835X(18)30267-7
DOI: https://doi.org/10.1016/j.compositesa.2018.07.004
Reference: JCOMA 5099

To appear in: *Composites: Part A*

Received Date: 11 March 2018
Revised Date: 4 July 2018
Accepted Date: 4 July 2018

Please cite this article as: Dickson, A.R., Sandquist, D., Mode of wood fibre breakage during thermoplastic melt processing, *Composites: Part A* (2018), doi: https://doi.org/10.1016/j.compositesa.2018.07.004

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ABSTRACT

During polymer composite melt processing thermomechanical wood pulp fibres (WF) have a different breakage mode than described for other natural fibres and glass fibre. During repeated bending, expected during twin-screw extrusion and injection moulding, WF fail by a mode related to their cross-section dimensions. Generally, fibres with large lumens relative to wall thickness ovalise and buckle. Conversely fibres with small lumens relative to wall thickness generally fracture. Confocal microscopy of WF extracted from the polymer matrix after melt processing showed a high degree of cross-section collapse of the bent and twisted fibres. The ability to cross-sectionally collapse during composites processing may make the fibres more resilient to repeated bending stresses and help with fibre length retention. Observations suggest fractures were initiated from the edges of the bent fibres and propagated across the fibre.

KEYWORDS: A. Wood fibres; B. Fibre deformation; D. Optical microscopy; E. Extrusion

CONFLICT OF INTEREST: There is no conflict of interest

1 INTRODUCTION

As high aspect ratios (fibre length / fibre diameter) provide greater mechanical strength to natural fibre composite materials [1, 2] the preservation of fibre length is a major focus of fibre