

# Contents

<b>1</b>	<b>Flame Retardant Biobased Polymers</b>	<b>1</b>
1.1	Introduction	1
1.2	Intumescent Flame Retardant Systems Based on APP	3
1.2.1	Use of Biobased Components with APP in PLA	3
1.2.2	Use of Nanoparticles and Functional Fillers with APP in PLA	6
1.2.3	Other Components in Intumescent Systems with APP for Biobased Polymers	10
1.3	FR Systems Based on Other Phosphorous and Nitrogenous FRs	12
1.3.1	Systems Based on Other Types of Phosphates	12
1.3.2	Novel FR Systems Based on Additive and Reactive FRs Containing Phosphorus and/or Nitrogen	14
1.4	Flame Retardant Systems Based on Functionalized or Modified Nanoparticles and Fillers	22
1.5	Conclusion	27
	References	28
<b>2</b>	<b>Biobased Flame Retardants</b>	<b>33</b>
2.1	Issues and Objectives	33
2.2	Thermal Behavior of Biomass-Based Matter	34
2.2.1	Carbohydrates	35
2.2.2	Proteins	38
2.2.3	Lipids	41
2.2.4	Phenolic Compounds	42
2.3	Strategies for Flame Retardancy with Biobased Compounds	44
2.3.1	Bio-resources as Intrinsic Flame Retardant	45
2.3.2	Bio-resources Combined with Phosphorus or Nitrogen Compounds	48

2.3.3	Modified Bio-resources with Enhanced Charring Effect . . . . .	53
2.3.4	Reactive Biobased Flame Retardants. . . . .	59
2.4	Opportunities for the Industrial Scale-up of Biobased FR Systems . . . . .	64
2.4.1	Fire Performance Criteria . . . . .	64
2.4.2	Environmental and Health Criteria . . . . .	65
2.4.3	Economic Criteria . . . . .	65
	References. . . . .	66
<b>3</b>	<b>Flame Retardancy of Natural Fibers Reinforced Composites . . . . .</b>	<b>73</b>
3.1	A Comparison Between Natural Fibers and Glass or Carbon Fibers. . . . .	73
3.1.1	Fire Behavior of Composites Filled with Glass or Carbon Fibers . . . . .	73
3.1.2	Flammability of Natural Fibers . . . . .	75
3.2	Fire Properties of Composites Reinforced by Natural Fibers . . . . .	78
3.2.1	Influence of Raw Natural Fibers . . . . .	78
3.2.2	Role of Lignin . . . . .	80
3.2.3	Comparison with CF or GF Composites . . . . .	82
3.3	Flame Retardancy of Biocomposites. . . . .	84
3.3.1	Incorporation of Flame Retardants into the Matrix . . . . .	84
3.3.2	Is to Flame Retard Natural Fibers Enough to Impart Fire Performances to Composites? . . . . .	86
3.3.3	Comparison of Both Approaches . . . . .	90
3.4	Conclusions . . . . .	93
	References. . . . .	94
	<b>Conclusion . . . . .</b>	<b>99</b>

Towards Bio-based Flame Retardant Polymers

Sonnier, R.; Taguet, A.; Ferry, L.; Lopez-Cuesta, J.-M.

2018, XVI, 100 p. 47 illus., Softcover

ISBN: 978-3-319-67082-9