

**Appendix G.** Experimental design of the energy input ways during the high-moisture extrusion process.

Samples	Energy sources	Shear orders	Energy input	Extrusion temperature ( °C)	Screw speed (rpm)	Feed rate (g.min <sup>-1</sup> )	Moisture contents (%)	Shear rate per unit mass (rpm.g <sup>-1</sup> )	Code		
1			LT-LM	135	210	100	50	2.1	1		
2			LT-MM	135	210	100	55	2.1	2		
3			LT-HM	135	210	100	60	2.1	3		
4	Extrusion temperature-moisture content	Pre-shear	MT-LM	145	210	100	50	2.1	4		
5			MT-MM	145	210	100	55	2.1	5		
6			MT-HM	145	210	100	60	2.1	6		
7			HT-LM	155	210	100	50	2.1	7		
8			HT-MM	155	210	100	55	2.1	8		
9			HT-HM	155	210	100	60	2.1	9		
10					LT-LS	135	180	100	55	1.8	10
11				Pre-shear	LT-HS	135	240	133.33	55	1.8	11
12			HT-LS		155	180	100	55	1.8	12	
13	HT-HS	155	240		133.33	55	1.8	13			
14			LT-LS		135	180	100	55	1.8	14	
15	Extrusion temperature-shear ways	Post-shear	LT-HS	135	240	133.33	55	1.8	15		
16			HT-LS	155	180	100	55	1.8	16		
17			HT-HS	155	240	133.33	55	1.8	17		
18			Synchronous	LT-LS	135	180	100	55	1.8	18	

19		shear	LT-HS	135	240	133.33	55	1.8	19
20			HT-LS	155	180	100	55	1.8	20
21			HT-HS	155	240	133.33	55	1.8	21
22			LM-LS	145	180	100	50	1.8	22
23		Pre-shear	LM-HS	145	240	133.33	50	1.8	23
24	HM-LS		145	180	100	60	1.8	24	
25	HM-HS		145	240	133.33	60	1.8	25	
26			LM-LS	145	180	100	50	1.8	26
27	Moisture contents-shear ways	Post-shear	LM-HS	145	240	133.33	50	1.8	27
28			HM-LS	145	180	100	60	1.8	28
29			HM-HS	145	240	133.33	60	1.8	29
30				LM-LS	145	180	100	50	1.8
31		Synchronous	LM-HS	145	240	133.33	50	1.8	31
32		shear	HM-LS	145	180	100	60	1.8	32
33			HM-HS	145	240	133.33	60	1.8	33

LT: extrusion temperature at 135 °C, MT: extrusion temperature at 145 °C, HT: extrusion temperature at 155 °C, LM: moisture content at 50%, MM: moisture content at 55%, HM: moisture content at 60%, LS: screw speed at 180 rpm and feed rate at 100 g.min<sup>-1</sup>, HS: screw speed at 240 rpm and feed rate at 133.33 g.min<sup>-1</sup>