

## Supporting Information

### The gluten biopolymer and nano-clay derived structures in wheat gluten-urea-clay composites; barrier and mechanical properties

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This Supported Information contains:

- **Table S1**, detailing tensile properties of WGG and WGG-5%C15A composites injection molded at 170, 180 and 190° C at transverse- and radial- directions.
- **Table S2**, detailing glass transition temperature of WGG and WGG-5%C15A composites injection molded at 170, 180 and 190° C.
- **Figure S1**, depicting SAXS patterns of C15A clay composites indicating the first Bragg peak from the HCP structure.
- **Figure S2**, depicting WAXS patterns of 1, 3 and 5 wt.% natural MMT and C15A composites.
- Two figures, two tables and in total 4 pages.

**Table S1.** Tensile properties of WGG and WGG-5%C15A composites injection molded at 170, 180 and 190° C: a) transverse direction; b) radial direction.

a)

Mechanical properties of the samples in transverse direction (TD)			
Sample <sup>1</sup>	E-modulus (Mpa)	Max stress (MPa)	Strain at break (%)
WGG-170	21 ± 5	1.5 ± 0.3	21.2 ± 9.6
WGG-180	28 ± 2	1.9 ± 0.3	14.7 ± 4.3
WGG-190	19 ± 6	1.3 ± 0.3	18.5 ± 7.0
WGG-5%C15A-170	13 ± 3	0.7 ± 0.2	16.0 ± 4.1
WGG-5%C15A-180	8 ± 1	0.3 ± 0.1	11.9 ± 4.2
WGG-5%C15A-190	10 ± 6	0.4 ± 0.2	11.9 ± 3.4

Mechanical properties are given with the average value and standard deviation.

b)

Mechanical properties of the samples in radial direction (RD)			
Sample	E-modulus (MPa)	Max stress (MPa)	Strain at break (%)
WGG-170	16 ± 6 g	1.1 ± 0.1	18.2 ± 7.3
WGG-180	22 ± 3 fg	1.4 ± 0.2	16.0 ± 2.8
WGG-190	19 ± 5 fg	1.2 ± 0.2	16.7 ± 7.3
WGG-5%C15A-170	10 ± 3 g	0.6 ± 0.2	16.2 ± 3.8
WGG-5%C15A -180	6 ± 2 g	0.2 ± 0.1	9.0 ± 2.9
WGG-5%C15A -190	9 ± 3 g	0.5 ± 0.2	14.9 ± 3.2

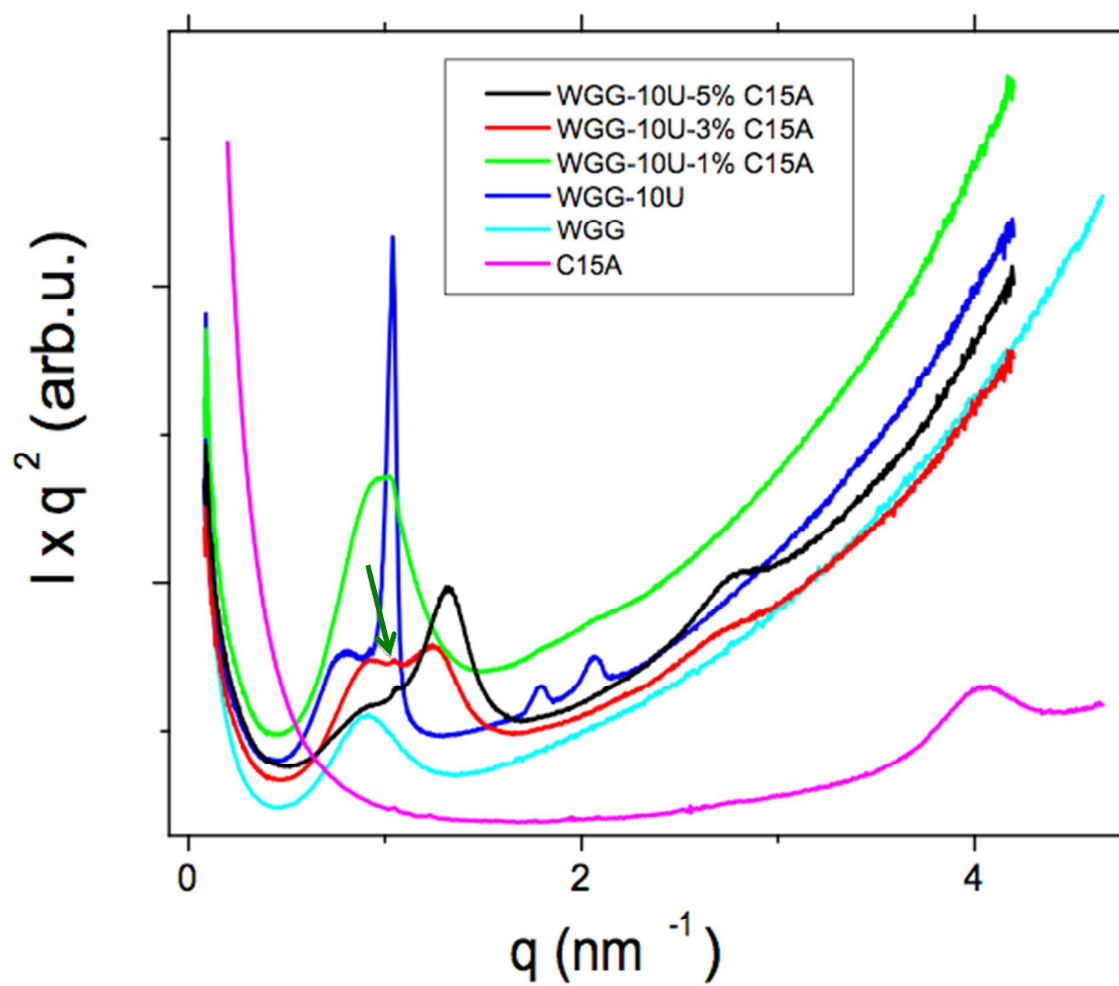
Mechanical properties are given with the average value and standard deviation.

**Table S2.** Glass transition temperature of WGG and WGG-5%C15A composites injection molded at 170, 180 and 190° C.

Glass transition temperatures of the samples by DSC		
Sample	Glass transition temperature (°C)	
	Onset	Midpoint
WGG-170	8.1 (0.9)	31.4 (1.2)
WGG-180	12.6 (4.2)	33.1 (2.2)
WGG-190	11.6 (2.1)	35.7 (1.3)
WGG-5%C15A -170	0.4 (3.6)	25.0 (3.2)
WGG-5%C15A -180	2.8 (1.4)	26.0 (0.9)
WGG-5%C15A -190	3.0 (1.9)	27.8 (1.0)

The values in parentheses are standard deviations.

**Figure S1.** SAXS patterns of C15A clay composites; (the first Bragg peak from the HCP structure is indicated by arrow).



**Figure S2.** WAXS patterns of 1, 3 and 5 wt.% natural MMT and C15A composites.

