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Supplementary Materials

Effects of Mineral Elements and Annealing on the Physicochemical Properties of Native Potato Starch

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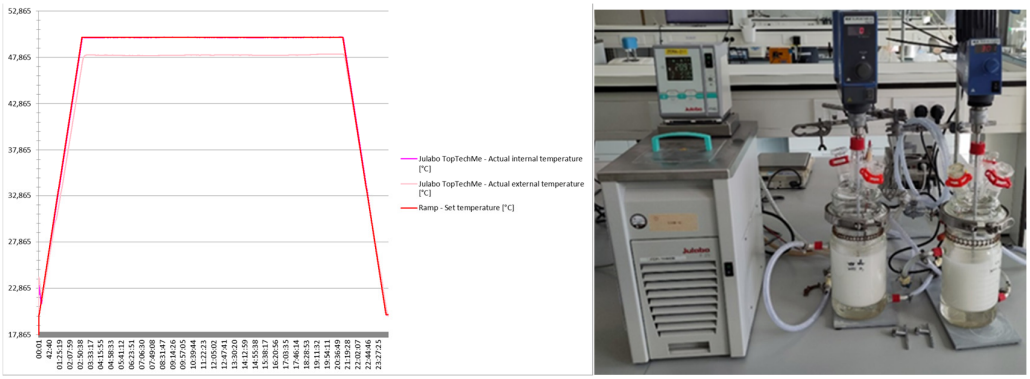

(a) (b)

Figure S1. Typical heating profile (a) and annealing set-up (b).

RVA Results of Sieved ANN NPS

To understand the development of a shoulder in the viscosity curve, ANN NPS was sieved using 0.050 mm, 0.036 mm, and 0.025 mm sieves (2 x 1 h shaking). The fractions were analyzed by means of RVA. The RVA of the ANN NPS and its size fractions clearly show that the annealing process impacts granules of different granular size differently. The smallest size fraction was the most strongly affected, exhibiting the lowest peak viscosity. Moreover, a strong shoulder is clearly visible. The second largest fraction showed the least pronounced shoulder and had a slightly higher peak viscosity than ANN NPS and the smaller fractions. The largest fraction could not be measured as too little material was obtained.

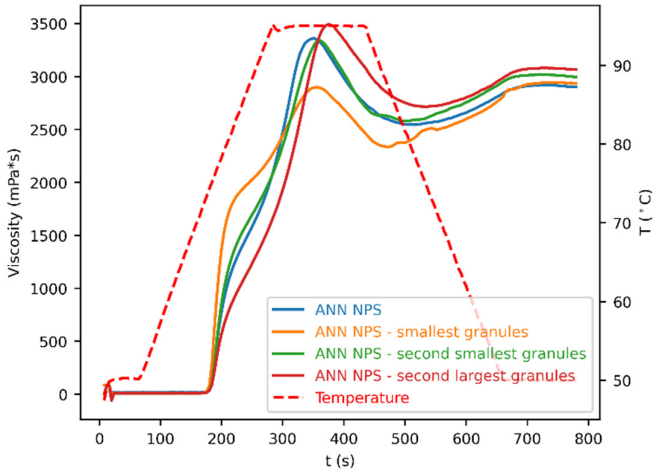

Figure S2. RVA profiles of ANN NPS and its sieved fractions.

Extra Experiment: Mg-Enrichment of ANN NPS:

Annealing with subsequent ion exchange at room temperature shows similar results in pasting properties compared to ANN in salt solution. The presence of magnesium therefore does not influence the annealing process of NPS greatly.

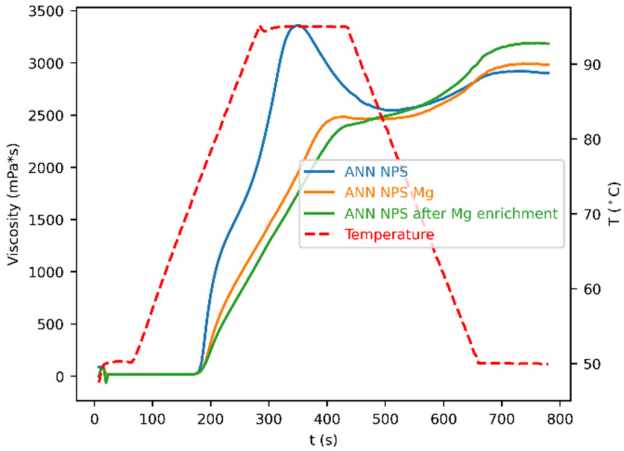

Figure S3. RVA profiles of ANN NPS Mg and NPS Mg in comparison with ANN NPS that was Mg-enriched as second step.

Table S1. Overview of sample composition including duplicate experiments for NPS Mg, NPS Ca and ANN NPS that was Mg-enriched as second step.

	Ca [µmol/g]	K [µmol/g]	Mg [µmol/g]	Na [µmol/g]	P [µmol/g]	Amylose content [mg/g]
NPS	4.16 ± 0.16	17.67 ± 0.08	1.84 ± 0.03	2.55 ± 0.17	24.16 ± 0.11	239.66 ± 0.22 (24.0%)
NPS Mg	0.70	0.15	15.88	0.48	24.57	-
NPS Mg duplicate experiment	2.45	0.00	19.05	0.65	24.76	-
NPS Ca	16.99	0.03	0.29	0.48	22.41	-
NPS Ca	20.34	0.00	2.72	0.65	24.28	-

duplicate experiment						
NPS Na	0.62	0.20	0.37	30.71	24.31	-
NPS K	0.75	29.16	0.33	0.65	23.99	-
ANN NPS	4.74	14.27	1.93	3.57	23.37	235.12 ± 0.55 (23.5%)
ANN NPS Mg	1.32	0.38	14.94	0.43	-	233.64 (23.3%)
ANN NPS Ca	14.37	0.36	0.21	0.35	-	232.54 (23.2%)
ANN NPS Na	0.50	0.46	0.21	28.71	-	232.97 (23.3%)
ANN NPS K	0.62	0.20	0.37	30.71	24.31	232.52 (23.3%)
ANN NPS Enriched with Mg in second step	0.51	0.08	0.11	0.03	-	-

Table S2. Overview of pasting properties including duplicate experiments for NPS Mg and NPS Ca and result for ANN NPS, Mg-enriched in second step (PV = peak viscosity, TV = trough viscosity, BD = breakdown, FV = final viscosity, SB = setback, PT = pasting temperature).

	PV [mPa·s]	**TV [mPa·s]**	**BD [mPa·s]**	**FV [mPa·s]**	**SB [mPa·s]**	**PT [°C]**
NPS	4036 ± 50	1597 ± 25	2439 ± 29	1864 ± 28	267 ± 17	69.5 ± 0.1
NPS Mg duplicate experiment	2956	1684	1272	2002	318	71.2
NPS Mg	2901	1610	1291	1897	287	71.2
NPS Ca duplicate experiment	2865	1599	1266	1886	287	71.0
NPS Ca	2963	1646	1317	1941	295	71.1
NPS Na	5446	1700	3746	1995	295	68.6
NPS K	5430	1693	3737	1997	304	68.7
ANN NPS	3361	2546	815	2904	358	74.4
sieved ANN NPS second smallest fraction	2900	2339	561	2935	596	74.3
sieved ANN NPS smallest fraction	3345	2580	765	2997	417	74.4
sieved ANN	3493	2715	778	3066	351	74.4

NPS second largest fraction						
ANN NPS Mg	2480	2156	324	2983	827	76.0
ANN NPS Ca	2392	2225	167	2812	587	76.0
ANN NPS Na	4298	2853	1445	3131	278	76.0
ANN NPS K	4128	2982	1146	3431	449	74.4
ANN NPS Enriched with Mg in second step	2355	1931	424	3184	1253	76.0