Porous Carbon Monoliths Made from Cellulose and Starch

Olaf Klepel [1]*, Nina Danneberg [2]

[1] Brandenburg University of Technology Cottbus – Senftenberg, Faculty of Environment and Natural Sciences, Universitätsplatz 1, D-01968 Senftenberg, Germany; olaf.klepel@b-tu.de
[2] Brandenburg University of Technology Cottbus – Senftenberg, Faculty of Mechanical Engineering, Electrical and Energy Systems, Universitätsplatz 1, D-01968 Senftenberg, Germany; nina.danneberg@b-tu.de
* Correspondence: olaf.klepel@b-tu.de; Tel.: +49-3573-85-864

Supplementary Materials

Table S1. Overview of the used precursors

	Microcrystalline cellulose	**Cellulose fibres**	**Potato starch**	**Wheat starch**
Supplier	Alfa Aesar	Carl Roth GmbH	Carl Roth GmbH	VWR Chemicals
Charge number	10189220		3352322411	15I170001

Table S2. Composition of the used carbon precursor mixtures – extended version

Carbon precursor 1	**Carbon precursor 2**	**Starch content [wt.%]**	**Sample denotation**
cellulose fibers	---	0	F
cellulose fibers	wheat starch	10	FW10
cellulose fibers	wheat starch	20	FW20
cellulose fibers	wheat starch	30	FW30
cellulose fibers	wheat starch	40	FW40
cellulose fibers	wheat starch	50	FW50
cellulose fibers	potato starch	10	FP10
cellulose fibers	potato starch	20	FP20
cellulose fibers	potato starch	30	FP30
cellulose fibers	potato starch	40	FP40
cellulose fibers	potato starch	50	FP50
microcrystalline cellulose	---	0	M
microcrystalline cellulose	wheat starch	10	MW10
microcrystalline cellulose	wheat starch	20	MW20
microcrystalline cellulose	wheat starch	30	MW30
microcrystalline cellulose	wheat starch	40	MW40
microcrystalline cellulose	wheat starch	50	MW50
microcrystalline cellulose	potato starch	10	MP10

microcrystalline cellulose	potato starch	20	MP 20
microcrystalline cellulose	potato starch	30	MP30
microcrystalline cellulose	potato starch	40	MP40
microcrystalline cellulose	potato starch	50	MP50

Table S3. Textural data of non-activated carbon monoliths made from microcrystalline cellulose and wheat starch

	S_{BET} (m^2g^{-1})	V_{DR} * (cm_3g-1)	Vsp (cm_3g-1)
M0	375	0.21	0.18
MW10	415	0.19	0.20
MW20	387	0.19	0.19
MW30	391	0.19	0.19
MW40	407	0.19	0.26
MW50	385	0.20	0.20

* Micropore volume (Dubinin-Raduzkevich)

Table S4. Textural data of non-activated carbon monoliths made from microcrystalline cellulose and potato starch

	S_{BET} (m^2g^{-1})	V_{DR}* (cm_3g-1)	Vsp (cm_3g-1)
M0	375	0.21	0.18
MP10	420	0.19	0.20
MP20	414	0.19	0.20
MP30	388	0.19	0.19
MP40	353	0.18	0.17
MP50	398	0.20	0.19

* Micropore volume (Dubinin-Raduzkevich)

Table S5. Textural data of activated carbon monoliths made from microcrystalline cellulose and potato starch

	S_{BET} (m^2g^{-1})	V_{DR}* (cm_3g-1)	Vsp (cm_3g-1)
M0_3M	296	0.13	0.14
M0_9M	1209	0.55	0.55
MP10_3M	775	0.36	0.36
MP20_3M	615	0.29	0.23
MP30_3M	378	0.17	0.18
MP40_3M	360	0.17	0.17
MP10_9M	776	0.36	0.36
MP20_9M	1143	0.52	0.52
MP40_9M	854	0.40	0.40

* Micropore volume (Dubinin-Raduzkevich)

Table S6. Textural data of activated carbon monoliths made from microcrystalline cellulose and wheat starch

	S_{BET} (m^2g^{-1})	V_{DR}* (cm_3g-1)	Vsp (cm_3g-1)
M0_3M	296	0.13	0.14
M0_9M	1209	0.55	0.55
MW10_3M	591	0.27	0.28
MW20_3M	509	0.24	0.23
MW30_3M	387	0.18	0.18
MW10_9M	870	0.42	0.42
MW20_9M	1097	0.49	0.49
MW30_-9M	1122	0.53	0.53

* Micropore volume (Dubinin-Raduzkevich)

Table S7. Textural data of activated carbon monoliths made from cellulose fibres and potato starch

	S_{BET} (m^2g^{-1})	V_{DR}* (cm_3g-1)	Vsp (cm_3g-1)
F0_3M	942	0.45	0.44
F0_9M	2602	0.96	1.20
FP10_3M	780	0.36	0.36
FP20_3M	1054	0.50	0.50
FP30_3M	910	0.43	0.42
FP40_3M	889	0.42	0.41
FP50_3M	727	0.34	0.34
FP10_9M	2443	0.81	1.15
FP20_9M	2728	0.90	1.30
FP30_9M	1896	0.82	0.90
FP40_9M	1830	0.76	0.86
FP50_9M	2767	0.88	1.35

* Micropore volume (Dubinin-Raduzkevich)

Table S8. Textural data of activated carbon monoliths made from cellulose fibres and wheat starch

	S_{BET} (m^2g^{-1})	V_{DR}* (cm_3g-1)	Vsp (cm_3g-1)
F0_3M	942	0.45	0.44
F0_9M	2602	0.96	1.22
FW10_3M	928	0.43	0.44
FW20_3M	855	0.40	0.39
FW30_3M	914	0.42	0.42
FW40_3M	832	0.39	0.39
FW50_3M	770	0.36	0.36
FW10_9M	2468	0.86	1.16
FW20_9M	2337	--	1.08
FW30_9M	1747	0.69	0.82
FW40_9M	2177	0.84	1.02
FW50_9M	2324	0.89	1.08

* Micropore volume (Dubinin-Raduzkevich)

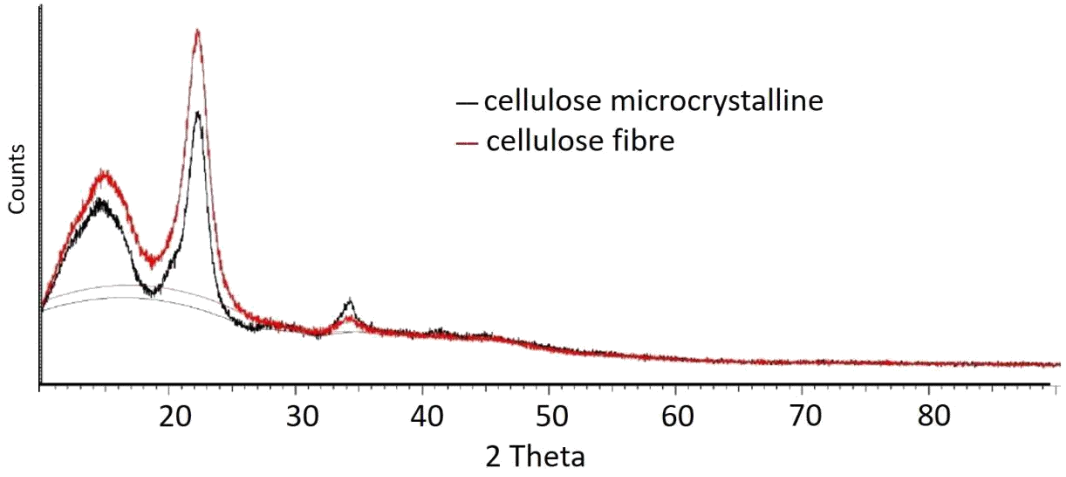

Figure S1. X-ray diffraction measurements of cellulose

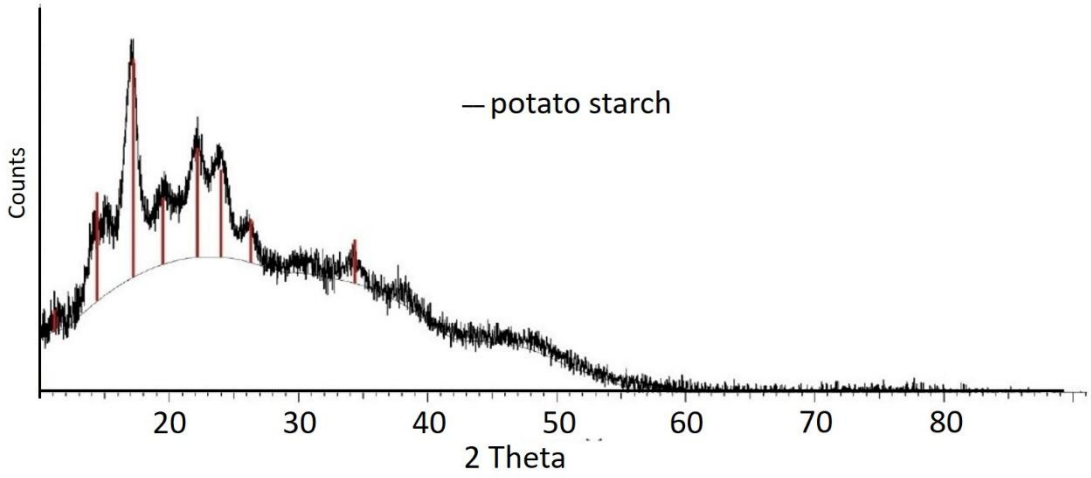

Figure S2. X-ray diffraction measurements of potato starch

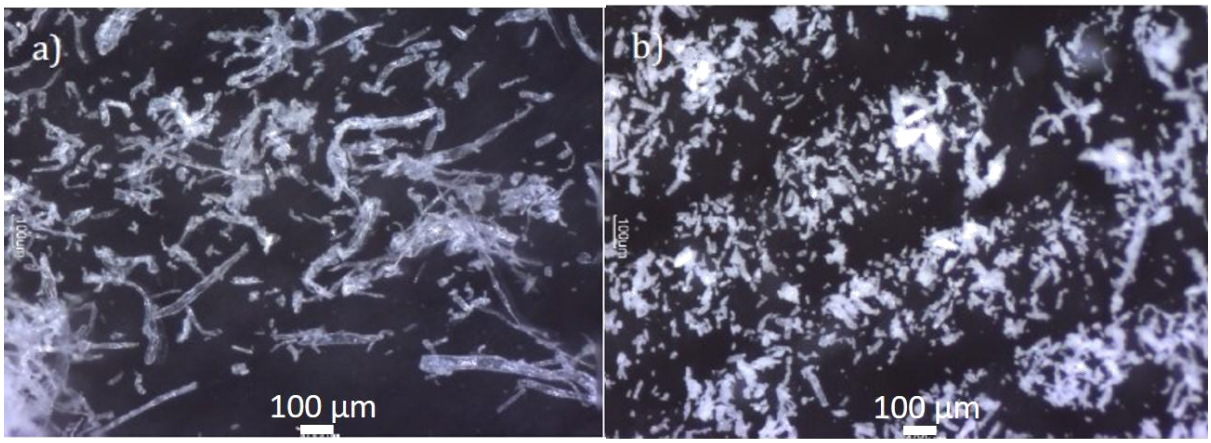

Figure S3. Light-microscopic image of cellulose fibres (a) and microcrystalline cellulose (b)

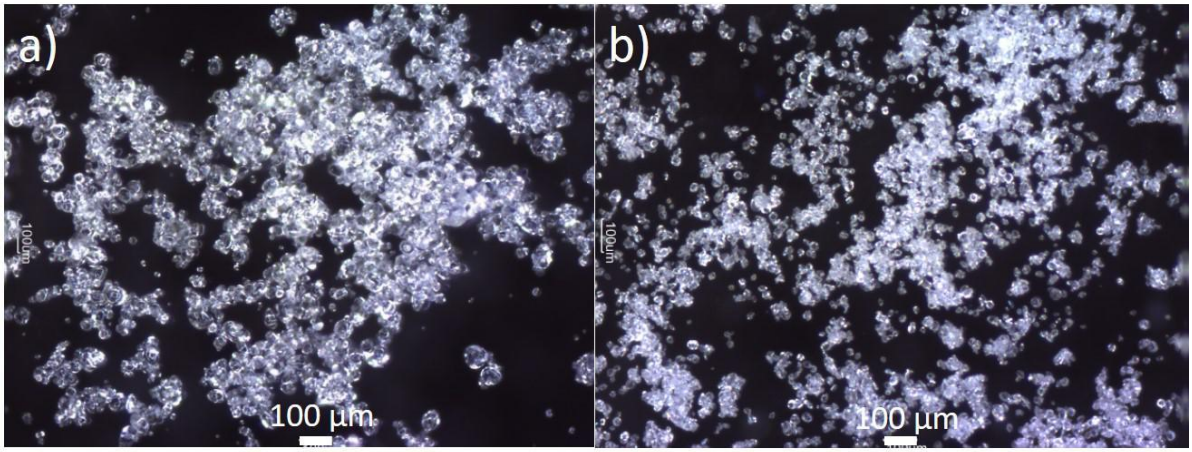

Figure S4. Light-microscopic image of potato starch (a) and wheat starch (b)

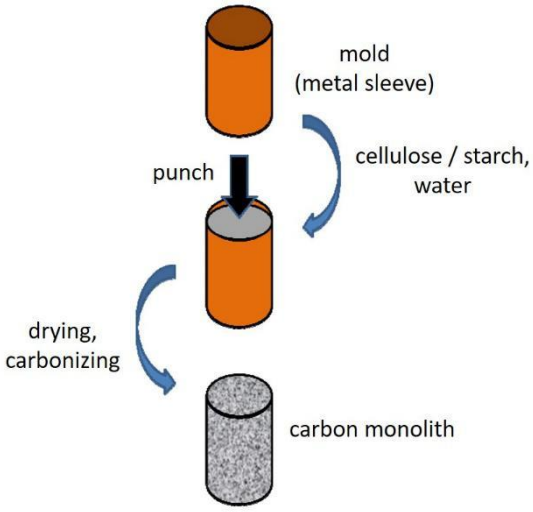

Figure S5. Sceme of the carbon monolith preparation

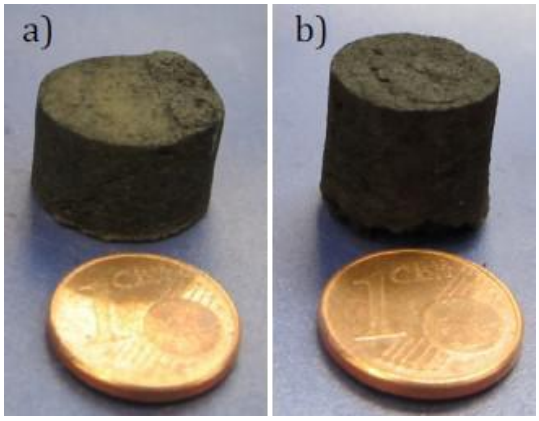

Figure S6. Photograph of carbon monoliths made from microcrystalline cellulose (a) and cellulose fibres (b).