6. Appendix

6.1. List of abbreviations and symbols

2D	Two dimensional
AFM	Atomic Force Microscope
CMC	Critical Micelle Concentration
DRS	Diffuse Reflectance Spectroscopy
GADDS	General Area Detector Diffraction System
FFT	Fast Fourier Transformation
ITO	Indium Tin Oxide
IR	InfraRed
LCT	Liquid Crystal Templating
MCM-41	Mobil Composition of Matter No. 41, a mesoporous material
MSF	Mesoporous Silica Film
MW	Molecular Weight
PBG	Photonic Band Gap
PhC	Photonic Crystal
PhC-LDR	Photonic Crystal Line Defect Resonator
PMMA	PolyMethylMethAcrylate
PS	PolyStyrene
PVP	PolyVinylPyrrolidone
PZT	LeadZirconateTitanate
RH	Relative Humidity

Rh6G	Rhodamine 6G dye
RIE	Reactive Ion Etching
RMS	Root Mean Square
RT	Room Temperature
RTA	Rapid Thermal Annealing
SAXS	Small Angle X-ray Scattering
SBA-15	Santa Barbara No. 15, a mesoporous material
SDA	Structure-Directing Agent
SEM	Scanning Electron Microscope
TEM	Transmission Electron Microscope
TE	Transversal Electric mode
THF	TetraHydroFuran
TM	Transversal Magnetic mode
UV-Vis	UV-Visible Spectroscopy
XRD	X-Ray Diffraction
vol.%	volume percent
wt.%	weight percent
Å	Ångstrøm (10^{-10} m)
α	incidence angle
α_{sc}	scattering coefficient
Δ_d	optical path difference
$\Delta\varphi$	phase shift
η	viscosity
ν	wavenumber, reciprocal wavelength
λ	wavelength
ρ	density
φ	phase angle (AFM), azimuthal angle (XRD)
ω	frequency (AFM), rotation angle of the sample stage (XRD)
A	amplitude (AFM), indentation area (nanoindentation)
b_i	damping constant
d	film thickness

d_s	*d*-spacing (XRD)
DR	diffuse reflectance
E	elastic modulus
F	force
H	hardness
h	contact depth
k	dielectric constant
k_i	spring constant
L	optical length
ℓ	horizontal distance
m	effective mass
n	refractive index
P	load
S	optical scattering (UV-Vis), stiffness (nanoindentation)
T	transmission
v	drawing velocity

6.2. Chemical reagents employed

Acetylacetone, 99+%	Aldrich
Dimethyaminoethanol (DMAE)	Polysciences
Epichlorohydrin and dipropylene glycol (D.E.R. 736)	Polysciences
Ethanol, 99.9%	Merck
Hydrochloric acid, 37% (2-molal)	Aldrich
Lead(II)-nitrate, 99.99+%	Aldrich
2-Methoxyethanol, 99.9+%	Aldrich
Nonenylsuccinic anhydride (NSA)	Polysciences
Pluronic P123 ($EO_{20}PO_{70}EO_{20}$)	BASF
Polymethylmethacrylate (PMMA), MW: 100.000	Polysciences
Polystyrene beads, 10 wt.% suspension	Duke Scientific
Polyvinylpyrrolidone (PVP), MW: 630.000	Alfa Aesar
Rhodamine 6G, ~95%	Aldrich
Tetrabutoxysilane, >97% (TBOS)	Fluka
Titanium(IV)-isopropoxide, 98%	Aldrich
Tetrahydrofuran (THF), 99.9+%	KMF Laborchemie
Vinylcyclohexene dioxide (VCD)	Polysciences
Zirconium(IV)-n-propoxide, 70 wt.% in n-propanol	Aldrich

6.3. Spatial dependence of dissipation in a porous system

A flat outer surface of a porous medium without pore openings to this surface can be imagined consisting of bridges and sustainers [112] as depicted in Figure 4.17 b). The mechanical properties of such a surface result from the mechanical constants of the bridges and sustainers, as well as from their arrangement leading to spatial variations. The parameters of the overall description, spring constants k_i and damping constants b_i, can be obtained from mesoscopic model parameters (k_t, k_b, k_s, b_s; index t: terrace, b: bridge, s: sustainer) by the requirement of identical mechanical behavior. This requirement leads to

$$\frac{1}{k_i + i\omega b_i} = \frac{1}{k_t} + \frac{1}{k_b} + \frac{1}{k_s + i\omega b_s} \tag{6.1}$$

for periodic forces of the angular frequency ω. To simplify this expression, we assumed that the force needed for compressing the sustainers are much larger than the direct tip-surface repulsion and the damping force in the sustainers ($k_b >> k_t$, $\omega \cdot b_s$). This assumption results in

$$k_i + i\omega b_i = \frac{1}{k_t^{-1} + k_b^{-1}} + i\omega \frac{b_s}{k_s^2} \frac{1}{\left(k_t^{-1} + k_b^{-1}\right)^2}. \tag{6.2}$$

The spatial dependence of the mechanical properties has two origins in this model. Firstly, the bridges can most efficiently be bended if the load is in the middle and, secondly, the load is distributed onto one or more sustainers depending on the tip position. Let us regard the two special positions x_b and x_s, which are the tip position at the middle of the bridge and the tip position on the top of a sustainer, respectively. On the bridge, the elasticity of the bridge is acting and the load is distributed on at least two sustainers:

$$k_b\left(x_b\right) = k_{b0},\ k_s\left(x_b\right) = 2k_{s0},\ b_s\left(x_b\right) = 2b_{s0}. \tag{6.3}$$

There the overall damping constant results in

$$b_i(x_b) = \frac{b_{s0}}{2k_{s0}^2} \frac{1}{\left(k_t^{-1} + k_{b0}^{-1}\right)^2} \tag{6.4}$$

However on the top of a sustainer, the bridge cannot be deformed and the load acts only on this sustainer,

$$k_\mathrm{b}\left(x_\mathrm{s}\right) \to \infty,\ k_\mathrm{s}\left(x_\mathrm{s}\right) = k_\mathrm{s0},\ b_\mathrm{s}\left(x_\mathrm{s}\right) = b_\mathrm{s0}. \tag{6.5}$$

resulting in the overall damping of

$$b_\mathrm{i}(x_\mathrm{s}) = \frac{b_\mathrm{s0}}{k_\mathrm{s0}^2} k_\mathrm{t}^2 \tag{6.6}$$

This means that the damping is at least 2 times larger on the top of a sustainer: $b_\mathrm{i}(x_\mathrm{s}) > 2\ b_\mathrm{i}(x_\mathrm{b})$ [112].

6.4. List of samples

6.4.1. Mesoporous silica films

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
BTR-BA-017-01	BA-010	15	--	--	0.3	A	998	625
BTR-BA-019-05	BA-016	14	53.1	21	0.6	B	1697	693
BTR-BA-019-06	BA-016	14	53.1	21	0.6	B	1729	693
BTR-BA-019-09	BA-016	14	53.1	21	0.9	B	2005	1181
BTR-BA-019-10	BA-016	14	53.1	21	0.9	B	2025	1249
BTR-BA-019-13	BA-016	14	53.1	21	1.2	B	2378	1095
BTR-BA-019-14	BA-016	14	53.1	21	1.2	B	2426	1065
BTR-BA-020-01	BA-016	20	40.8	22	0.3	A	840	686
BTR-BA-020-02	BA-016	20	40.8	22	0.3	A	968	720
BTR-BA-020-03	BA-016	20	40.8	22	0.6	A	1616	1015
BTR-BA-020-04	BA-016	20	40.8	22	0.6	A	1725	1005
BTR-BA-020-05	BA-016	20	40.8	22	0.6	A	1731	1002
BTR-BA-020-06	BA-016	20	40.8	22	0.6	A	1731	1003
BTR-BA-020-07	BA-016	20	40.8	22	0.6	A	1656	1004
BTR-BA-020-08	BA-016	20	40.8	22	0.6	A	1728	1007
BTR-BA-021-01	BA-016	23	35.8	22	0.6	A	1764	1028
BTR-BA-021-02	BA-016	23	35.8	22	0.6	A	1749	990
BTR-BA-021-03	BA-016	23	35.8	22	0.6	A	1752	1003
BTR-BA-021-04	BA-016	23	35.8	22	0.6	A	1745	1008
BTR-BA-021-05	BA-016	23	35.8	22	0.6	A	1738	1050
BTR-BA-021-06	BA-016	23	35.8	22	0.6	A	1664	1057
BTR-BA-021-07	BA-016	23	35.8	22	0.6	A	1735	1049
BTR-BA-021-08	BA-016	23	35.8	22	0.6	A	1724	1031
BTR-BA-022-01	BA-016	28	44.1	22-23	0.45	A	1509	755
BTR-BA-022-02	BA-016	28	44.1	22-23	0.45	A	1574	777
BTR-BA-022-03	BA-016	28	44.1	22-23	0.45	A	1492	742
BTR-BA-022-04	BA-016	28	44.1	22-23	0.45	A	1547	797
BTR-BA-022-05	BA-016	28	44.1	22-23	0.45	A	1437	784
BTR-BA-022-06	BA-016	28	44.1	22-23	0.45	A	1542	795
BTR-BA-022-07	BA-016	28	44.1	22-23	0.45	A	1462	789
BTR-BA-022-08	BA-016	28	44.1	22-23	0.45	A	1564	780
BTR-BA-037-04	BA-036	0	48.7	24	0.8	A	932	588
BTR-BA-037-05	BA-036	0	48.7	24	1	A	1002	641
BTR-BA-037-10	BA-036	0	48.7	24	1	A	--	--
BTR-BA-040-07	BA-039	2	67.5	24	1	B	--	--
BTR-BA-044-06	BA-043	1	51.9	24.5	1	B	--	--
BTR-BA-067-02	BA-065	1	45.8	22	0.9	B	--	750
BTR-BA-083-02	BA-081	22	26.5	17	0.3	A	--	797
BTR-BA-083-03	BA-081	22	28.2	17	0.3	A	--	778
BTR-BA-083-04	BA-081	22	28.2	17	0.3	A	--	783
BTR-BA-083-06	BA-081	22	39.0	17	0.6	A	--	1180

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
BTR-BA-083-07	BA-081	22	30.9	17	0.6	A	--	1227
BTR-BA-083-08	BA-081	22	39.2	17	0.6	A	--	1222
BTR-BA-083-10	BA-081	22	39.0	17	0.9	A	--	1495
BTR-BA-083-11	BA-081	22	39.7	17	0.9	A	--	1569
BTR-BA-083-12	BA-081	22	39.7	17	0.9	A	--	1553
BTR-BA-084-01	BA-081	25	22.4	22	0.9	A	2583	--
BTR-BA-088-02	BA-087	1	32.9	19	1	A	2132	1058
BTR-BA-088-03	BA-087	1	33.2	19	1	A	2084	1005
BTR-BA-088-04	BA-087	1	33.2	19	1	A	2097	1005
BTR-BA-088-05	BA-087	1	34.9	19	1	A	2116	998
BTR-BA-088-06	BA-087	1	34.9	19	1	A	2154	1027
BTR-BA-088-07	BA-087	1	35.0	19	1	A	2150	1020
BTR-BA-088-08	BA-087	1	35.0	19	1	A	2088	1014
BTR-BA-088-09	BA-087	1	33.6	19	1	A	2142	981
BTR-BA-088-10	BA-087	1	33.6	19	1	A	2241	1021
BTR-BA-089-08*	BA-087	12	35.2*	19	0.8	B	2058	1009
BTR-BA-089-09*	BA-087	12	31.1*	19	0.8	B	2055	863
BTR-BA-090-02	BA-087	21	33.9	19	0.8	A	2260	1349
BTR-BA-090-03	BA-087	21	36.5	19	0.8	A	2209	1234
BTR-BA-090-04	BA-087	21	36.5	19	0.8	A	2198	1104
BTR-BA-090-05	BA-087	21	32.1	19	0.8	A	2233	1373
BTR-BA-090-06	BA-087	21	32.1	19	0.8	A	2224	1238
BTR-BA-090-07	BA-087	21	35.0	19	0.8	A	2283	1338
BTR-BA-090-08	BA-087	21	35.0	19	0.8	A	2287	1327
BTR-BA-090-09	BA-087	21	36.2	19	0.8	A	2212	1279
BTR-BA-090-10	BA-087	21	36.2	19	0.8	A	2218	1319
BTR-BA-091-02	BA-087	28	33.1	20	0.55	A	1928	1096
BTR-BA-091-03	BA-087	28	35.8	20	0.55	A	1918	1111
BTR-BA-091-04	BA-087	28	35.8	20	0.55	A	1816	1099
BTR-BA-091-05	BA-087	28	26.3	20	0.55	A	1912	1049
BTR-BA-091-06	BA-087	28	36.7	20	0.55	A	1930	1015
BTR-BA-091-07	BA-087	28	27.2	20	0.55	A	1834	962
BTR-BA-091-08	BA-087	28	37.2	20	0.55	A	1825	820
BTR-BA-091-09	BA-087	28	35.1	20	0.55	A	1924	819
BTR-BA-091-10	BA-087	28	35.1	20	0.55	A	1924	885
BTR-BA-092-03	BA-087	33	35.1	20	0.5	A	1706	866
BTR-BA-092-04	BA-087	33	35.1	20	0.5	A	1714	786
BTR-BA-095-02	BA-094	1	33.2	19.3	0.5	A	--	633
BTR-BA-095-04	BA-094	1	34.9	19.3	0.8	A	--	888
BTR-BA-095-05	BA-094	1	34.1	19.4	0.8	A	--	920
BTR-BA-095-06	BA-094	1	34.1	19.4	0.8	A	--	939
BTR-BA-095-07	BA-094	1	35.7	19.4	0.8	A	--	968
BTR-BA-095-08	BA-094	1	35.7	19.4	0.8	A	--	937
BTR-BA-095-09	BA-094	1	36.1	19.5	0.8	A	--	935
BTR-BA-095-10	BA-094	1	36.1	19.5	0.8	A	--	959
BTR-BA-096-01	BA-094	8	34.5	19.9	0.8	A	--	--
BTR-BA-096-02	BA-094	8	34.9	19.9	0.8	A	--	943
BTR-BA-096-03	BA-094	8	33.8	20	0.8	A	--	938
BTR-BA-096-05	BA-094	8	33.1	20	0.8	A	--	930

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
BTR-BA-097-01	BA-094	16	37.8	20.6	0.75	A	--	965
BTR-BA-097-02	BA-094	16	37.9	20.6	0.75	A	--	991
BTR-BA-097-03	BA-094	16	38.1	20.7	0.75	A	2042	1042
BTR-BA-097-04	BA-094	16	38.1	20.7	0.75	A	2112	1108
BTR-BA-100-01	BA-098	6	26.9	20	0.9	A	--	1011
BTR-BA-100-02	BA-098	6	28.7	20	0.9	A	--	1011
BTR-BA-100-03	BA-098	6	30.5	20	0.9	A	--	1001
BTR-BA-100-06	BA-098	6	32.3	20	0.9	A	1997	1139
BTR-BA-102-01	BA-098	13	23.1	20	0.75	A	--	940
BTR-BA-102-02	BA-098	13	25.0	20	0.75	A	--	927
BTR-BA-102-03	BA-098	13	23.1	20	0.75	A	--	--
BTR-BA-102-05	BA-098	13	23.1	20	0.6	A	1636	840
BTR-BA-102-07	BA-098	13	23.1	20	0.75	A	1920	1070
BTR-BA-104-01	BA-098	20	21.2	19	0.7	A	--	1007
BTR-BA-104-02	BA-098	20	21.2	19	0.7	A	--	1015
BTR-BA-104-03	BA-098	20	21.2	19	0.7	A	--	1012
BTR-BA-104-05	BA-098	20	19.2	18.5	0.7	A	1961	1109
BTR-BA-104-07	BA-098	20	19.2	18.5	0.6	A	1715	1005
BTR-BA-109-01	BA-107	6	55.8	19	0.85	B	1844	688
BTR-BA-109-02	BA-107	6	55.8	19	0.85	B	1824	691
BTR-BA-109-08	BA-107	6	57.2	19	0.85	B	--	--
BTR-BA-110-01	BA-107	15	26.9	17	0.75	A	1923	1134
BTR-BA-110-02	BA-107	15	26.9	17	0.75	A	1938	1133
BTR-BA-110-05	BA-107	15	26.9	17	0.75	A	--	833
BTR-BA-110-06	BA-107	15	26.9	17	0.75	A	--	853
BTR-BA-111-06	BA-107	20	23.1	20	0.75	A	--	--
BTR-BA-112-01	BA-107	27	26.9	20	0.7	A	2007	945
BTR-BA-112-02	BA-107	27	26.9	20	0.7	A	2007	940
BTR-BA-112-05	BA-107	27	26.9	20	0.7	A	--	906
BTR-BA-112-06	BA-107	27	26.9	20	0.7	A	--	897
BTR-BA-112-07	BA-107	27	26.9	20	0.7	A	--	889
BTR-BA-114-01	BA-113	3	26.9	20	0.8	A	1902	982
BTR-BA-114-02	BA-113	3	26.9	20	0.8	A	1926	985
BTR-BA-114-03	BA-113	3	25.0	20	0.8	A	1931	--
BTR-BA-114-05	BA-113	3	23.1	20	0.8	A	--	918
BTR-BA-114-06	BA-113	3	25.0	20	0.8	A	--	882
BTR-BA-114-07	BA-113	3	25.0	20	0.8	A	--	912
BTR-BA-114-08	BA-113	3	26.9	20	0.8	A	--	972
BTR-BA-115-01	BA-113	6	37.5	21	0.75	A	1868	1029
BTR-BA-115-02	BA-113	6	37.5	21	0.75	A	1850	1036
BTR-BA-115-09*	BA-113	6	42.5*	21	0.75	B	--	--
BTR-BA-117-01	BA-113	12	34.1	20	0.7	A	1854	843
BTR-BA-117-02	BA-113	12	34.1	20	0.7	A	1787	829
BTR-BA-117-05	BA-113	12	39.2	20	0.7	A	--	810
BTR-BA-117-06	BA-113	12	40.8	20	0.7	A	--	801
BTR-BA-117-07	BA-113	12	40.8	20	0.7	A	--	801
BTR-BA-117-08	BA-113	12	40.8	20	0.7	A	--	803
BTR-BA-119-01	BA-113	32	34.1	20	0.6	A	1819	833
BTR-BA-119-02	BA-113	32	34.1	20	0.6	A	1823	788

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
BTR-BA-123-05	BA-121	3	44.1	20	0.8	A	--	914
BTR-BA-123-06	BA-121	3	44.1	20	0.8	A	--	919
BTR-BA-126-02	BA-121	9	37.5	20	0.7	A	1847	1183
BTR-BA-126-04	BA-121	9	37.5	20	0.7	A	1876	1182
BTR-BA-126-05	BA-121	9	37.5	20	0.7	A	--	933
BTR-BA-126-06	BA-121	9	39.2	20	0.7	A	--	882
BTR-BA-130-01	BA-121	24	40.8	23	0.6	A	1737	1036
BTR-BA-130-05	BA-128	3	45.6	23	0.8	B	--	662
BTR-BA-130-09	BA-129	3	42.5	23	0.8	A	1692	--
BTR-BA-132-01	BA-131	4	30.5	22	0.8	A	1572	1057
BTR-BA-132-02	BA-131	4	30.5	22	0.8	A	--	1067
BTR-BA-133-03	BA-131	11	39.2	24.5	0.8	B	--	876
BTR-BA-133-05	BA-131	11	42.5	24.5	0.8	B	1718	--
BTR-BA-137-01	BA-135	22	45.6	21	0.7	A	--	869
BTR-BA-137-02	BA-135	22	44.1	21	0.7	A	--	855
BTR-BA-137-03	BA-135	22	46.4	21	0.7	A	--	902
BTR-BA-137-04	BA-135	22	42.5	21	0.7	A	1883	877
BTR-BA-137-06	BA-135	22	39.2	21	0.7	A	1845	863
BTR-BA-140-02	BA-139	1	44.5	22.5	0.7	B	1849	705
BTR-BA-140-04	BA-139	1	44.5	22.5	0.8	B	1741	650
BTR-BA-140-06	BA-139	1	44.5	22.5	0.9	B	1825	719
BTR-BA-141-01	BA-139	9	19.2	21	0.8	A	1854	858
BTR-BA-141-03	BA-139	9	19.2	21	0.8	A	1857	863
BTR-BA-141-05	BA-139	9	19.2	21	0.8	A	--	867
BTR-BA-141-06	BA-139	9	18.2	21	0.8	A	--	893
BTR-BA-141-06	BA-139	9	18.2	21	0.8	A	--	882
BTR-BA-142-01	BA-139	17	24.1	22	0.7	A	1685	869
BTR-BA-142-02	BA-139	17	24.1	22	0.7	A	1834	865
BTR-BA-142-05	BA-139	17	25.0	22	0.7	A	--	855
BTR-BA-143-01	BA-139	30	20.2	21	0.6	A	--	808
BTR-BA-143-02	BA-139	30	21.2	21	0.6	A	--	803
BTR-BA-143-03	BA-139	30	20.2	21	0.6	A	--	823
BTR-BA-143-04	BA-139	30	20.2	21	0.6	A	1824	720
BTR-BA-143-06	BA-139	30	20.2	21	0.6	A	1843	723
BTR-BA-147-02	BA-145	7	20.2	20	0.7	A	--	858
BTR-BA-148-01	BA-145	23	34.1	20	0.6	A	1766	858
BTR-BA-148-02	BA-145	23	34.1	20	0.6	A	1762	840
BTR-BA-148-05	BA-145	23	35.8	20	0.6	A	--	800
BTR-BA-148-06	BA-145	23	35.8	20	0.6	A	--	804
BTR-BA-148-07	BA-145	23	35.8	20	0.6	A	--	814
BTR-BA-153-01	BA-152	1	45.6	21.5	0.2	A	678.4	373
BTR-BA-153-02	BA-152	1	45.6	21.5	0.2	A	--	390
BTR-BA-153-03	BA-152	1	45.6	21.5	0.3	A	827.2	461
BTR-BA-153-04	BA-152	1	45.6	21.5	0.3	A	--	472
BTR-BA-153-05	BA-152	1	46.4	21.5	0.5	A	1292.0	624
BTR-BA-153-06	BA-152	1	46.4	21.5	0.5	A	--	611
BTR-BA-153-07	BA-152	1	46.4	21.5	0.6	A	1350.6	714
BTR-BA-153-08	BA-152	1	46.4	21.5	0.6	A	--	715
BTR-BA-153-09	BA-152	1	46.4	21.5	0.7	A	1659.4	812

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
BTR-BA-153-10	BA-152	1	46.4	21.5	0.7	A	--	805
BTR-BA-153-11	BA-152	1	47.2	21.5	0.8	A	1791.0	863
BTR-BA-153-12	BA-152	1	47.2	21.5	0.8	A	--	855
BTR-BA-153-13	BA-152	1	47.2	21.5	1	A	1940.8	940
BTR-BA-153-14	BA-152	1	47.2	21.5	1	A	--	946
BTR-BA-153-15	BA-152	1	47.2	21.5	1.5	A	2650.8	1285
BTR-BA-153-16	BA-152	1	47.2	21.5	1.5	A	--	1331
BTR-BA-154-01	BA-152	7	43.3	21.5	0.2	?	970.4	417
BTR-BA-154-02	BA-152	7	43.3	21.5	0.2	?		401
BTR-BA-154-03	BA-152	7	43.3	21.5	0.3	?	1203.4	467
BTR-BA-154-04	BA-152	7	43.3	21.5	0.3	?		504
BTR-BA-154-05	BA-152	7	43.3	21.5	0.5	?	1388.2	616
BTR-BA-154-06	BA-152	7	43.3	21.5	0.5	?		642
BTR-BA-154-07	BA-152	7	43.3	21.5	0.6	?	1662.4	589
BTR-BA-154-08	BA-152	7	43.3	21.5	0.6	?		760
BTR-BA-154-09	BA-152	7	43.3	21.5	0.7	?	1816.4	680
BTR-BA-154-10	BA-152	7	43.3	21.5	0.7	?		834
BTR-BA-154-11	BA-152	7	43.3	21.5	0.8	?	1973.8	749
BTR-BA-154-12	BA-152	7	43.3	21.5	0.8	?		905
BTR-BA-154-13	BA-152	7	43.3	21.5	1	?	2211.6	743
BTR-BA-154-14	BA-152	7	43.3	21.5	1	?		1013
BTR-BA-154-15	BA-152	7	43.3	21.5	1.5	?	2833	948
BTR-BA-154-16	BA-152	7	43.3	21.5	1.5	?	--	1321
BTR-BA-155-01	BA-152	14	47.2	22.5	0.2	A	--	431
BTR-BA-155-02	BA-152	14	47.2	22.5	0.2	A	--	428
BTR-BA-155-03	BA-152	14	47.2	22.5	0.3	A	--	590
BTR-BA-155-04	BA-152	14	47.2	22.5	0.3	A	--	554
BTR-BA-155-05	BA-152	14	47.2	22.5	0.5	A	--	691
BTR-BA-155-06	BA-152	14	47.2	22.5	0.5	A	--	693
BTR-BA-155-07	BA-152	14	47.2	22.5	0.6	A	--	768
BTR-BA-155-08	BA-152	14	47.2	22.5	0.6	A	--	766
BTR-BA-155-09	BA-152	14	47.2	22.5	0.7	A	--	872
BTR-BA-155-10	BA-152	14	47.2	22.5	0.7	A	--	880
BTR-BA-155-15	BA-152	14	48.7	22.5	0.8	A	--	930
BTR-BA-155-16	BA-152	14	48.7	22.5	1.5	A	--	1344
BTR-BB-159-05	BA-158	1	50.2	28	0.5	B	1570	566
BTR-BB-159-06	BA-158	1	50.2	28	0.5	B	1223	475
BTR-BB-159-07	BA-158	1	50.2	28	0.8	B	1698	656
BTR-BB-159-08	BA-158	1	50.2	28	0.8	B	1744	676
BTR-BB-160-08	BA-158	13	67.0	24	0.8	B	--	--
KOD-KA-034-01	KA-034	4	39.2	20	0.5	A		650
KOD-KA-034-03	KA-034	4	39.2	20	0.5	A		gradient
KOD-KA-034-05	KA-034	4	39.2	20	0.8	A		gradient
KOD-KA-034-07	KA-034	4	39.2	20	0.8	A		939
KOD-KA-035-02	KA-034	7	47.2	20	1	B		gradient
KOD-KA-035-04	KA-034	7	45.6	20	1.5	B		gradient
KOD-KA-035-06	KA-034	7	45.6	20	1	A-B		897
KOD-KA-035-08	KA-034	7	44.1	20	1.5	B		1327
KOD-KA-037-02	KA-034	12	42.5	19	1.7	A		gradient

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
KOD-KA-037-04	KA-034	12	42.5	19	2	A		gradient
KOD-KA-037-06	KA-034	12	42.5	19	0.5	A		690
KOD-KA-037-08	KA-034	12	42.5	19	0.8	A		837
KOD-KA-038-03	KA-038	1	32.3	22	1.4	A		gradient
KOD-KA-038-07	KA-038	1	28.7	22	0.5	A		696
KOD-KA-038-08	KA-038	1	28.7	22	0.5	A		656
KOD-KA-038-09	KA-038	1	28.7	22	0.7	A		810
KOD-KA-038-10	KA-038	1	28.7	22	0.7	A		827
KOD-KA-038-11	KA-038	1	28.7	22	0.7	A		812
KOD-KA-038-13	KA-038	1	28.7	22	1	A		904
KOD-KA-038-14	KA-038	1	28.7	22	1	A		919
KOD-KA-039-02	KA-038	13	21.2	21	0.5	A		gradient
KOD-KA-039-04	KA-038	13	21.2	21	1	A		gradient
KOD-KA-039-05	KA-038	13	21.2	21	1.5	A		gradient
KOD-KA-042-01	KA-042	1	21.2	22	0.8	A		812
KOD-KA-042-02	KA-042	1	21.2	22	0.8	A		765
KOD-KA-042-03	KA-042	1	23.1	22	0.8	A		769
KOD-KA-042-04	KA-042	1	23.1	22	0.7	A		731
KOD-KA-042-05	KA-042	1	25.0	22	1.4	A		gradient
KOD-KA-042-07	KA-042	1	55.8	22	1.4	B		gradient
KOD-KA-042-08	KA-042	1	45.6	22	0.7	B		757
KOD-KA-042-09	KA-042	1	44.1	22	0.7	B		761
KOD-KA-042-10	KA-042	1	53.1	22	0.7	B		772
KOD-KA-042-11	KA-042	1	53.1	22	0.7	B		791
KOD-KA-042-12	KA-042	1	65.8	22	0.7	B		732
KOD-KA-042-13	KA-042	1	65.8	22	0.7	B		659
KOD-KA-043-01	KA-042	2	23.1	20.5	0.7	A		858
KOD-KA-043-02	KA-042	2	23.1	20.5	0.7	A		859
KOD-KA-043-09	KA-038	29	40.8	21	1.4	B		gradient
KOD-KA-043-11	KA-038	29	51.6	21	1.4	B		gradient
KOD-KA-043-12	KA-038	29	62.3	21	1.4	B		gradient
KOD-KA-043-13	KA-038	29	67.0	21	0.7	B		714
KOD-KA-043-14	KA-038	29	68.1	21	0.7	B		731
KOD-KA-045-01	KA-045	2	19.2	20	0.7	A		981
KOD-KA-045-02	KA-045	2	19.2	20	0.7	A		988
KOD-KA-045-05	KA-045	2	30.5	21	1.5	A		gradient
KOD-KA-045-06	KA-045	2	30.5	21	1.5	A		gradient
KOD-KA-045-07	KA-045	2	34.1	21	0.7	A		1026
KOD-KA-045-08	KA-045	2	34.1	21	0.7	A		1004
KOD-KA-045-09	KA-045	2	50.2	21	0.7	B		1005
KOD-KA-045-10	KA-045	2	48.7	21	0.7	B		1002
KOD-KA-045-12	KA-045	2	61.1	22	1.5	B		gradient
KOD-KA-045-14	KA-045	2	64.7	22	0.7	B		769
KOD-KA-046-01	KA-045	8	26.9	20	0.7	A		1088
KOD-KA-046-02	KA-045	8	26.9	20	0.7	A		1073
KOD-KA-046-05	KA-045	8	35.8	21	1.4	A		gradient
KOD-KA-046-06	KA-045	8	37.5	21	1.4	A		gradient
KOD-KA-046-07	KA-045	8	35.8	21	0.7	A		1143
KOD-KA-046-08	KA-045	8	35.8	21	0.7	A		1097

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
KOD-KA-046-09	KA-045	8	47.2	21	0.7	B		934
KOD-KA-046-10	KA-045	8	45.6	21	0.7	B		1074
KOD-KA-046-11	KA-045	8	42.5	21	1.4	A-B		gradient
KOD-KA-046-13	KA-045	8	39.2	21	0.7	A		1184
KOD-KA-046-14	KA-045	8	39.2	21	0.7	A		1125
KOD-KA-050-01	KA-050	1	35	20	0.8	A		901
KOD-KA-050-02	KA-050	1	36	20	0.8	A		894
KOD-KA-050-03	KA-050	1	36	20	0.8	A		872
KOD-KA-050-04	KA-050	1	34	20	0.8	A		880
KOD-KA-050-05	KA-050	1	35	20	0.7	A		827
KOD-KA-050-06	KA-050	1	34	20	0.7	A		843
KOD-KA-050-07	KA-050	1	33	20	1	A		983
KOD-KA-050-08	KA-050	1	33	20	1	A		993
KOD-KA-050-09	KA-050	1	34	20	0.8	A		804
KOD-KA-050-10	KA-050	1	34	20	0.8	A		787
KOD-KA-050-11	KA-050	1	35	20	0.8	A		824
KOD-KA-050-13	KA-050	1	36	20	0.8	A		809
KOD-KA-050-14	KA-050	1	34	20	0.8	A		788
KOD-KA-053-01	KA-050	14	32	20	0.8	A		922
KOD-KA-053-02	KA-050	14	32	20	0.8	A		934
KOD-KA-053-03	KA-050	14	30	20	0.8	A		902
KOD-KA-053-04	KA-050	14	30	20	0.8	A		905
KOD-KA-055-06	KA-055	1	31	22	0.8	A		gradient
KOD-KA-055-07	KA-055	1	30	22	0.7	A		777
KOD-KA-055-08	KA-055	1	30	22	0.7	A		827
KOD-KA-055-09	KA-055	1	32	22	0.7	A		802
KOD-KA-055-10	KA-055	1	33	22	0.7	A		783
KOD-KA-055-11	KA-055	1	32	22	0.7	A		808
KOD-KA-055-12	KA-055	1	32	22	0.8	A		830
KOD-KA-055-13	KA-055	1	31	22	0.8	A		800
KOD-KA-063-01	KA-061	21	43	21	0.8	B		917
KOD-KA-063-02	KA-061	21	44	21	0.8	B		925
KOD-KA-063-03	KA-061	21	42	21	0.8	B		938
KOD-KA-063-04	KA-061	21	44	22	0.8	B		919
KOD-KA-063-05	KA-061	21	45	22	0.6	B		788
KOD-KA-063-06	KA-061	21	42	22	0.6	B		826
KOD-KA-063-07	KA-061	21	41	22	0.6	B		913
KOD-KA-063-08	KA-061	21	41	22	0.6	B		906
KOD-KA-063-09	KA-061	21	45	22	0.6	B		671
KOD-KA-063-10	KA-061	21	44	22	0.6	B		--
KOD-KA-063-11	KA-061	21	42	22	0.6	B		676
KOD-KA-063-12	KA-061	21	42	22	0.6	B		675
KOD-KA-063-13	KA-061	21	43	22	0.8	B		741
KOD-KA-063-14	KA-061	21	43	22	0.8	B		751
KOD-KA-063-15	KA-061	21	42	22	0.8	B		750
KOD-KA-063-16	KA-061	21	41	22	0.8	B		846
KOD-KA-065-01	KA-065	2	44	22	0.8	A		933
KOD-KA-065-02	KA-065	2	42	22	0.8	A		1030
KOD-KA-065-03	KA-065	2	38	22	0.8	A		1030

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
KOD-KA-065-04	KA-065	2	35	22	0.8	A		1012
KOD-KA-065-05	KA-065	2	38	22	0.7	A		928
KOD-KA-065-06	KA-065	2	39	22	0.7	A		914
KOD-KA-065-07	KA-065	2	42	22	0.7	A		904
KOD-KA-065-08	KA-065	2	35	22	0.8	A		1021
KOD-KA-065-09	KA-065	2	36	22	0.8	A		931
KOD-KA-065-10	KA-065	2	38	22	0.8	A		1101
KOD-KA-065-11	KA-065	2	36	22	0.8	A		1132
KOD-KA-065-12	KA-065	2	36	22	0.7	A		907
KOD-KA-065-13	KA-065	2	36	22	0.7	A		965
KOD-KA-066-01	KA-065	3	37	22	0.8	A		918
KOD-KA-066-02	KA-065	3	37	22	0.8	A		879
KOD-KA-066-03	KA-065	3	32	22	0.8	A		891
KOD-KA-066-04	KA-065	3	31	22	0.8	A		942
KOD-KA-066-05	KA-065	3	34	22	1	A		1037
KOD-KA-066-06	KA-065	3	34	22	1	A		1055
KOD-KA-066-07	KA-065	3	34	22	1	A		1050
KOD-KA-066-08	KA-065	3	37	22	0.8	A		1000
KOD-KA-066-09	KA-065	3	36	22	0.8	A		937
KOD-KA-066-10	KA-065	3	36	22	0.8	A		1103
KOD-KA-066-11	KA-065	3	35	22	0.8	A		978
KOD-KA-066-12	KA-065	3	35	22	1	A		1056
KOD-KA-069-01	KA-065	3	40	22	0.6	A		720
KOD-KA-069-02	KA-065	3	34	22	0.6	A		940
KOD-KA-069-03	KA-065	3	39	22	0.6	A		750
KOD-KA-069-04	KA-065	3	44	22	0.6	A		749
KOD-KA-069-05	KA-065	3	43	22	0.5	A		711
KOD-KA-069-06	KA-065	3	43	22	0.5	A		648
KOD-KA-069-07	KA-065	3	42	22	0.5	A		680
KOD-KA-069-08	KA-065	3	42	22	0.5	A		696
KOD-KA-071-01	KA-071	1	42	21	0.7	A		751
KOD-KA-071-02	KA-071	1	45	21	0.7	A		759
KOD-KA-071-03	KA-071	1	46	21	0.7	A		755
KOD-KA-071-04	KA-071	1	45	21	0.7	A		803
KOD-KA-071-05	KA-071	1	44	21	0.8	A		843
KOD-KA-071-06	KA-071	1	45	21	0.8	A		911
KOD-KA-071-07	KA-071	1	36	22	0.8	A		927
KOD-KA-071-08	KA-071	1	40	22	0.8	A		918
KOD-KA-071-09	KA-071	1	41	22	0.6	A		714
KOD-KA-071-10	KA-071	1	42	22	0.6	A		695
KOD-KA-071-11	KA-071	1	43	22	0.6	A		712
KOD-KA-071-12	KA-071	1	46	22	0.7	A		992
KOD-KA-071-13	KA-071	1	47	22	0.7	A		862
KOD-KA-071-14	KA-071	1	45	22	0.7	A		854
KOD-KA-071-15	KA-071	1	44	22	0.7	A		847
KOD-KA-071-16	KA-071	1	46	22	0.8	A		1034
KOD-KA-071-17	KA-071	1	46	22	0.8	A		1065
KOD-KA-075-01	KA-075	2	38	22	0.7	A		954
KOD-KA-075-02	KA-075	2	38	22	0.7	A		926

Sample code	Solution	Age [d]	RH [%]	T [°C]	v [mm/s]	Type	d-nonc. [nm]	d-calc. [nm]
KOD-KA-075-03	KA-075	2	40	22	0.7	A		949
KOD-KA-075-04	KA-075	2	40	22	0.7	A		962
KOD-KA-075-05	KA-075	2	40	22	0.5	A		682
KOD-KA-075-06	KA-075	2	40	22	0.5	A		669
KOD-KA-075-07	KA-075	2	43	22	0.5	A		788
KOD-KA-075-08	KA-075	2	40	22	0.5	A		700
KOD-KA-075-09	KA-075	2	42	22	0.8	A		1086
KOD-KA-075-10	KA-075	2	43	22	0.8	A		1029
KOD-KA-075-11	KA-075	2	43	22	0.8	A		1039
KOD-KA-075-12	KA-075	2	42	22	0.8	A		1058
KOD-KA-075-13	KA-075	2	40	22	0.7	A		973
KOD-KA-075-14	KA-075	2	40	22	0.7	A		965
KOD-KA-075-15	KA-075	2	41	22	0.7	A		965
KOD-KA-076-01	KA-075	4	36	21	0.6	A		828
KOD-KA-076-02	KA-075	4	38	21	0.6	A		816
KOD-KA-076-03	KA-075	4	39	21	0.6	A		817
KOD-KA-076-04	KA-075	4	38	21	0.6	A		838
KOD-KA-076-05	KA-075	4	38	21	0.5	A		777
KOD-KA-076-06	KA-075	4	38	21	0.5	A		652
KOD-KA-076-07	KA-075	4	40	21	0.5	A		653
KOD-KA-076-08	KA-075	4	38	21	0.5	A		727
KOD-KA-076-09	KA-075	4	41	21	0.6	A		857
KOD-KA-076-10	KA-075	4	39	21	0.6	A		873
KOD-KA-076-11	KA-075	4	39	21	0.6	A		867
KOD-KA-076-12	KA-075	4	40	21	0.6	A		857
KOD-KA-076-13	KA-075	4	39	21	0.5	A		805
KOD-KA-076-14	KA-075	4	40	21	0.5	A		766
KOD-KA-076-15	KA-075	4	40	21	0.5	A		790
KOD-KA-076-16	KA-075	4	39	21	0.5	A		812

The samples marked with * transformed to B-type after drying in air with higher humidity.

6.4.2. PZT Films

Sample code	Solution	Age [d]	v [mm/s]	d-nonc. [nm]	d-calc. [nm]
KOD-KA-013-01	KA-013	1	0.5	681	130
KOD-KA-013-02	KA-013	1	0.5	681	137
KOD-KA-013-03	KA-013	7	0.3	431	101
KOD-KA-014-01	KA-013	12	1	1018	
KOD-KA-014-02	KA-013	12	1	1012	213
KOD-KA-014-03	KA-013	12	1.5	1316	
KOD-KA-014-04	KA-013	12	1.5	1334	291
KOD-KA-014-05	KA-013	12	2	1453	
KOD-KA-014-06	KA-013	12	2	1508	284
KOD-KA-014-07	KA-013	12	1	1146	317
KOD-KA-015-01	KA-015	3	0.1	282	63

Sample code	Solution	Age [d]	v [mm/s]	d-nonc. [nm]	d-calc. [nm]
KOD-KA-015-02	KA-015	3	0.1	307	73
KOD-KA-015-03	KA-015	3	0.2	354	81
KOD-KA-015-04	KA-015	3	0.2	357	85
KOD-KA-015-05	KA-015	3	0.4	493	123
KOD-KA-015-06	KA-015	3	0.4	497	123
KOD-KA-015-07	KA-015	3	0.8	735	167
KOD-KA-015-08	KA-015	3	0.8	754	167
KOD-KA-016-01	KA-016	1	0.2	452	100
KOD-KA-016-02	KA-016	1	0.4	622	132
KOD-KA-016-03	KA-016	2	0.6	820	157
KOD-KA-016-04	KA-016	2	0.8	1064	210
KOD-KA-016-05	KA-016	2	1	1140	228
KOD-KA-016-06	KA-016	2	1.2	1216	243
KOD-KA-016-07	KA-016	2	1.5	1350	276
KOD-KA-016-08	KA-016	2	2	1514	310
KOD-KA-017-01	KA-016	7	0.1	383	76
KOD-KA-017-02	KA-016	7	0.2		79
KOD-KA-017-03	KA-016	7	0.2	447	86
KOD-KA-017-04	KA-016	7	0.8	907	177
KOD-KA-051-01	KA-051	3	0.7		192
KOD-KA-053-03	KA-051	6	0.5		140
KOD-KA-055-12	KA-051	26	0.5		
KOD-KA-056-04	KA-051	26	0.3		99
BTR-BB-161-01	KA-016	254	0.5		203
BTR-BB-161-02	KA-016	254	0.5		206
BTR-BB-161-03	KA-016	254	0.5		214
BTR-BB-161-04	KA-016	254	0.8		259
BTR-BB-161-05	KA-016	254	0.8		266
BTR-BB-161-06	KA-016	254	0.8		279

6.5. List of publications

Parts of this work have already been published in papers listed below and in conference contributions as oral presentations or posters.

Papers:

- T. Voss, G.T. Svacha. E. Mazur, S. Müller, C. Ronning, D. Konjhodzic, F. Marlow, *High Order Waveguide Modes in ZnO Nanowires*, *Nano Letters* (2007) (accepted).

- D. Konjhodzic, S. Schröter, F. Marlow, *Ultra-low Refractive Index Mesoporous Substrates for Waveguide Structures*, *Phys. Stat. Sol. (a)* **204** (2007) 3676.

- A.S.G. Khalil, D. Konjhodzic, F. Marlow, *Hierarchy Selection, Position Control, and Orientation of Growing Mesostructures by Patterned Surfaces*, *Advanced Materials* **18** (2006) 1055 (cover paper).

- D. Konjhodzic, H. Bretinger, F. Marlow, *Structure and Properties of Low-n Mesoporous Silica Films for Optical Applications*, *Thin Solid Films* **495** (2006) 333.

- F. Marlow, D. Konjhodzic, H. Bretinger, H. Li, *Sol-Gel Approaches to Photonic Crystal Systems*, *Adv. Solid State Physics* **45** (2005) 149.

- D. Konjhodzic, H. Bretinger, U. Wilczok, A. Dreier, A. Ladenburger, M. Schmidt, M. Eich, F. Marlow, *Low-n Mesoporous Silica Films: Structure and Properties*, *Appl. Phys. A* **81** (2005) 425.

- M. Schmidt, G. Boettger, M. Eich, W. Morgenroth, U. Huebner, H. G. Meyer, D. Konjhodzic, H. Bretinger, F. Marlow, *Ultra Low Refractive Index Substrates – A Novel Base for Photonic Crystal Slab Waveguides*, *Appl. Phys. Lett.* **85** (2004) 16-18; Web-Reprint: *Virtual Journal of Nanoscale Science & Technology* **10** (2004) Issue 2.

Conferences:

- D. Konjhodzic, M. Herrmann, F. Marlow, Stability of Mesoporous Silica Films, *Frühjahrstagung des Arbeitskreises Festkörperphysik bei der DPG*, Regensburg, March 2007.

- D. Konjhodzic, H. Bretinger, F. Marlow, Properties of Low Refractive Index Supports Made of Mesoporous Silica, *AMOP-Frühjahrstagung der DPG*, Frankfurt, March 2006.

- D. Konjhodzic, H. Bretinger, F. Marlow Structure and Properties of Low-n Mesoporous Silica Films for Optical Applications, *European Congress on Advanced Materials and Processes*, Prague, Czech Republic, September 2005.

- F. Marlow, D. Konjhodzic, Low-n Films for Photonic Crystal Systems, 13th *International Workshop on Sol-Gel Science and Technology*, Los Angeles, USA, August 2005.

- D. Konjhodzic, H. Bretinger, F. Marlow, Structure and Properties of Low-n Mesoporous Silica Films for Optical Applications, *E-MRS Spring Meeting*, Strasbourg, France, June 2005.

- D. Konjhodzic, H. Bretinger, F. Marlow, S. Schröter, Structure and Properties of Low-n Mesoporous Silica Films for Optical Applications, *Physik seit Einstein, 69. Jahrestagung der DPG*, Berlin, March 2005.

- F. Marlow, D. Konjhodzic, H. Bretinger, U. Wilczok, Global Defects, Domains and Unknown Structures in Mesoporous Silica Films, Fibers and Particles, 103. *Hauptversammlung der Deutschen Bunsen-Gesellschaft*, Dresden, May 2004.

- D. Konjhodzic, M. Schmidt, H. Bretinger, M. Eich, F. Marlow, Structure Determination of Mesoporous Silica Films for Optical Applications, *EuroConference on Guest-Functionalized Molecular Sieve Systems*, Hattingen, March 2004.

- D. Konjhodzic, M. Schmidt, H. Bretinger, M. Eich, F. Marlow, Structure Determination of Mesoporous Silica Films for Optical Applications, *Frühjahrstagung des Arbeitskreises Festkörperphysik bei der DPG*, Regensburg, March 2004.