Supplementary Material

Surfactant Provided Control of Crystallization Polymorphic Outcome and Stabilization of Metastable Polymorphs of 2,6-Dimethoxyphenylboronic Acid

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Table S1. List of additives used in the study.

Additive	Purity / characteristics	Supplier
Hydroxypropyl cellulose (HPC)	M.W. 100 000	Alfa
Polyethylene glycol (PEG)	M.W. 6 000	Alfa
	M.W. 600	Alfa
Sodium carboxymethyl cellulose (Na CMC)	M.W. 250 000 (DS=1,2)	Acros
Glycine	99 %	Acros
2,2-Bis(hydroxymethyl)-2,2',2''-nitrilotriethanol (BIS-TRIS)	99 %	Fluorochem
4-carboxybenzeneboronic acid (4-COOHPBA)	98 %	Fluorochem
Phenylboronic acid (PBA)	98 %	Fluorochem
NH_4Cl	99 %	Acros
Polysorbate 80	≤4.0 % H_2O	Alfa
Tween 20 (polysorbate 20)	≤3.0 % H_2O	Sigma
Poly(acrylic acid) (PAS)	25 wt % soln. in water	Alfa
Poly(acrylic amide) (PAA)	M.W. 5 to 6 000 000	Acros
4-iodphenylboronic acid (4-IPBA)	98 %	Fluorochem
(E)-stilbene	>98 %	TCI
Polyethylene	M.W. 35 000	Aldrich Chemistry
2-hydroxyphenylboronic acid (2OHPBA)	98 %	Fluorochem
2-picolinic acid (2PicA)	98 %	Fluorochem
Polystyrene, atactic	M.W. 125 000 – 250 000	Alfa
Poly(methyl methacrylate) (PMMA)	M.W. 550 000	Alfa
Salicylic acid (SA)	99 %	Alfa
2,6-dimethoxybenzoic acid (2,6MeOBA)	99 %	Alfa
1,2,3-trihydroxybenzene (triOHB)	95 %	Fluorochem
Lactose monohydrate	Ph. Eur.	Sigma
Poly(tetrahydrofuran) (PolyTHF)	M.W. 1 000, contains 0,05 – 0,07 % BHT as stabilizer	Aldrich Chemistry
Polypropylene glycol (PPG)	M.W. 1 000	Alfa

Table S2. Approximate solubility of MPBA Form I in different solvents.

Solvent	Solubility, mg·mL^{-1}
Water	2
Acetonitrile	230
Toluene	12
Tetrahydrofuran	190
Nitromethane	135
Isopropanol	100

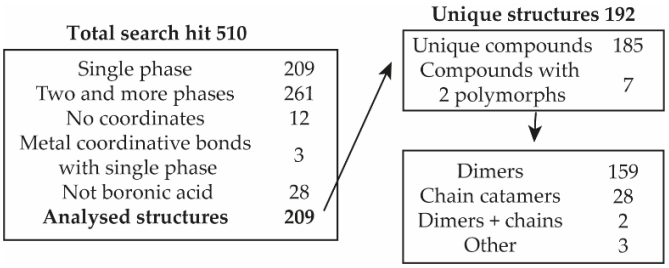


Figure S1. CSD search results for phenylboronic acid derivatives.

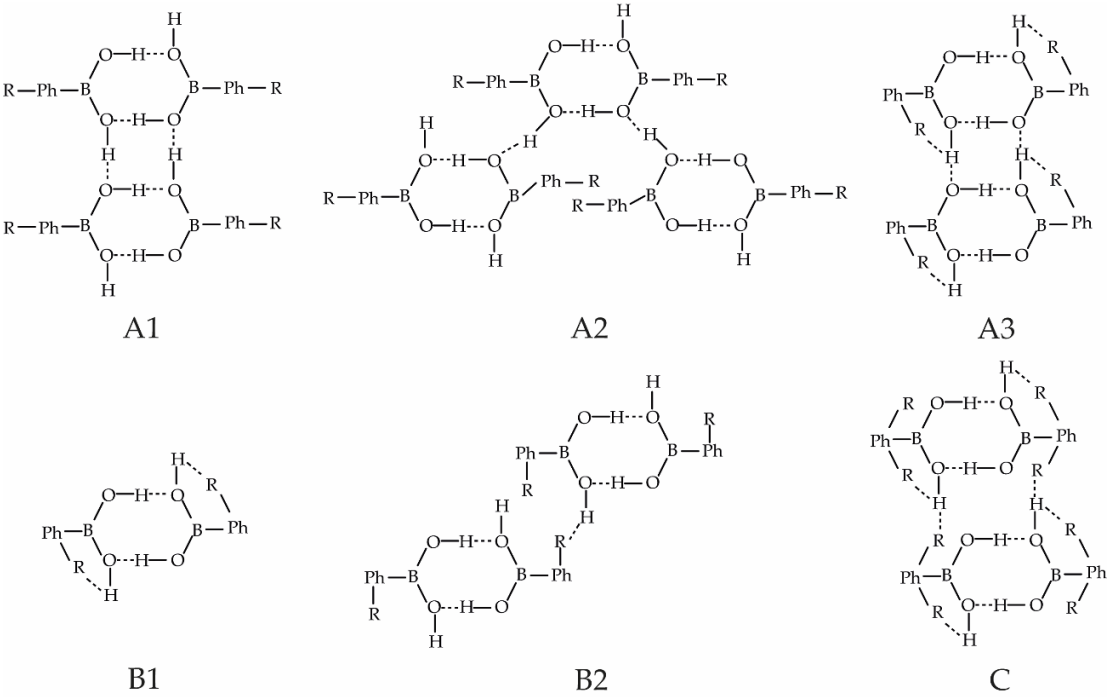


Figure S2. Types of dimeric hydrogen bond motifs observed in the crystal structures of phenylboronic acid derivatives in CSD.

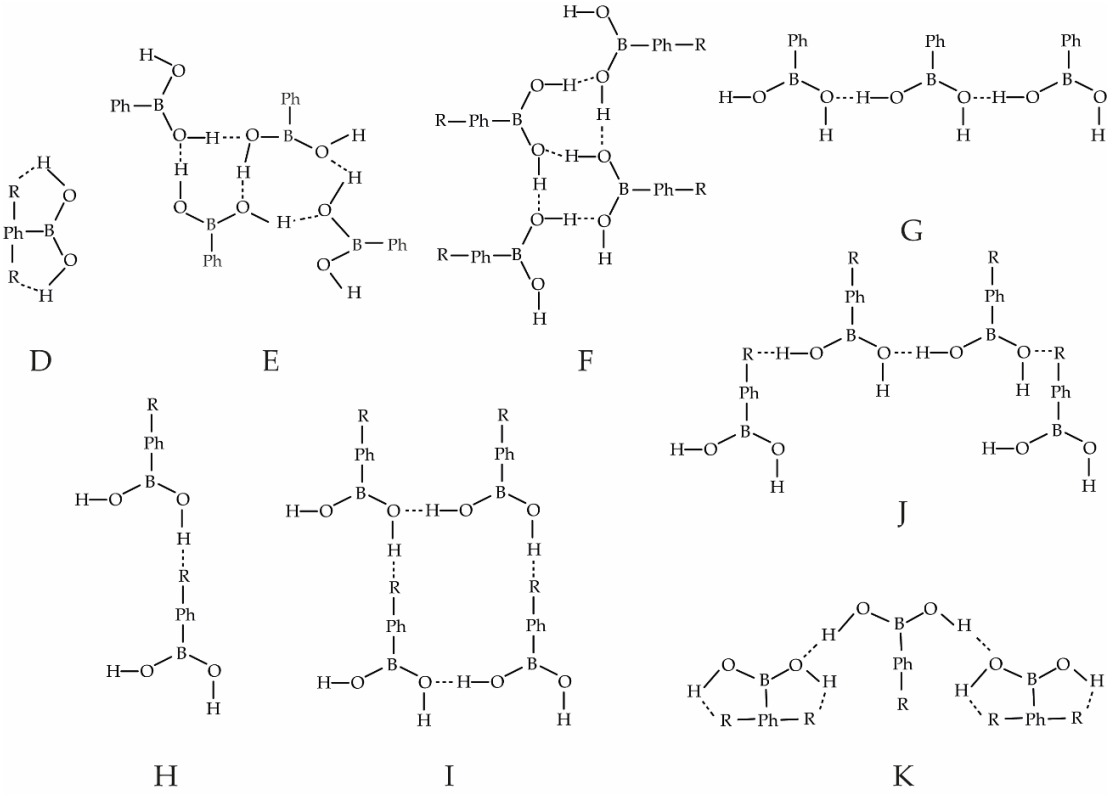
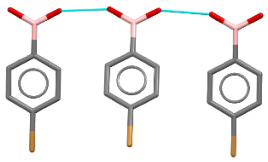
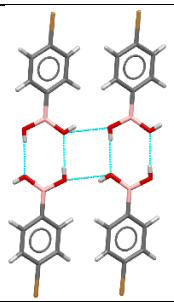
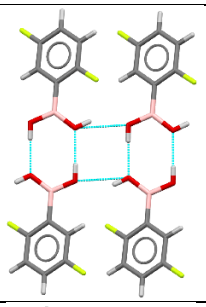
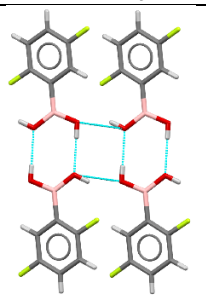
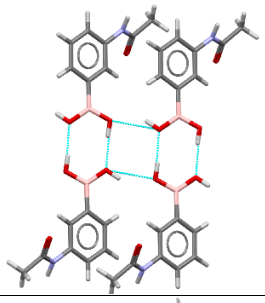
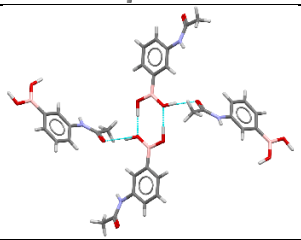
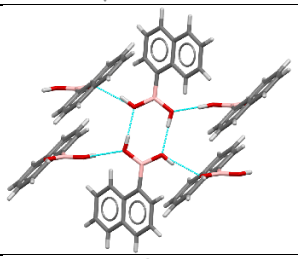
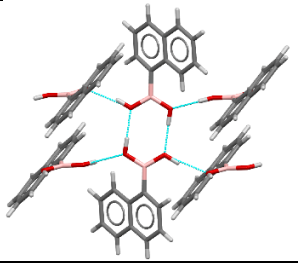


Figure S3. Types of non-dimeric hydrogen bond motifs observed in the crystal structures of phenylboronic acid derivatives in CSD.

Table S3. Polymorphism observed in phenylboronic acid derivatives.

Substance	Ref. code	Space group	Type of boronic acid hydrogen bond	Structures
p-Bromophenylboronic acid	BPHBAC	$P6_3/mcc$	Chain, type G	
	BPHBAC01	$P\bar{1}$	Dimers, type A1	

(2,5-Difluorophenyl)boronic acid	DOVJOP	$P2_1/c$	Dimers, type A1	
	DOVJOP01	$P2_1/n$	Dimers, type A1	
(3-Acetamidophenyl)boronic acid	GUKWER	$P\bar{1}$	Dimers, type A1	
	GUKWER01	$P2_1/c$	Dimers, type B2	
1-Naphthylboronic acid	ISANOH	$Pna2_1$	Dimers, type A2	
	ISANOH01	$P2_1/c$	Dimers, type A2	

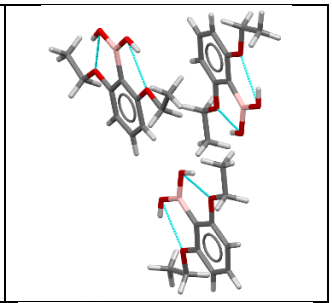
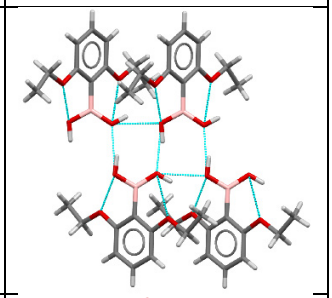
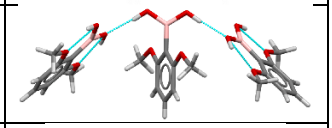
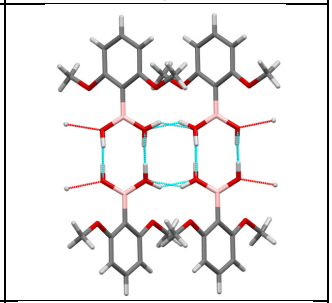
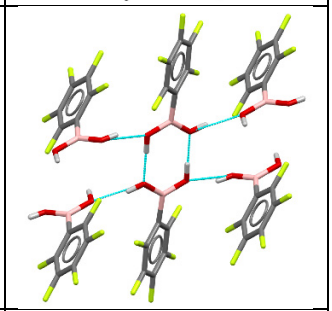
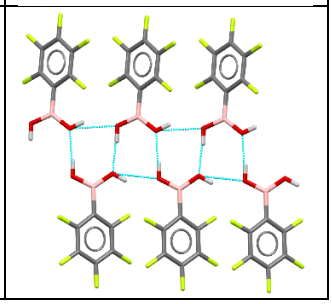
2,6-Diethoxyphenylboronic acid	UJACAL	$P2_1/c$	Intramolecular hydrogen bonding, type D	
	UJACAL01	$P2_1/n$	Chain, type F	
2,6-Dimethoxyphenylboronic acid (MPBA)	UJACIT	$C2/c$	Chain, type K	
	UJACIT01	$P\bar{4}n2$ $\bar{1}$	Dimers, type A1	
Pentafluorophenylboronic acid	WAJXEL	$P2_1/c$	Dimers, type A2	
	WAJXEL01	$P2_1$	Chain, type F	

Table S4. Types of dimeric structures from CSD search results for phenylboronic acid derivatives.

Dimer type	Conformation	Dimer bonding	CSD reference code	Count	%
A1	*syn-anti*	$R_2^2(8)$ dimers forming 2 mutual $C(4)$ chains	AXODAV; BASQOD; BPHBAC01; DITCUH; DOVHON; DOVHUT; DOVJEF; DOVJIJ; DOVJOP; DOVJOP01; GUKWER; GURQIW; HIRGEV; ISEPII; IYAXAH; NALFIT; NEBTAR; NEBTEV; PEJYUB and PEJYUB01; PEJZAI; PEJZIQ; PEJZOW; QIXBOR; RISYEA; TECCEL; TUNGAK and TUNGAK01; TUNQID; UMUHOZ; WENZUL; WIYMUN and WIYMUN01; XAJNUU; ZAPDAV; ZILBEB; DIMZUX; DINBAG; GISVIO; GUFFOF; GUFFUL; GUFGEW; GURPUH; HUXXII; WIYMOH and WIYMOH01; WIYPEA and WIYPEA02; WURHUP; UJACIT01	45	28.3
A2	*syn-anti*	$R_2^2(8)$ dimers forming 2 seperate $C(4)$ chains	AFOLUC; ISANOH; ISANOH01; NIQYUI; OCAJUY; OLIDOC; PAXSUD; PEJZEM; PEKBAL, PHBORA and PHBORA01-PHBORA03; RISXUP; RISYAW; VOSZUA; WAJXEL; WIYNAU; XARNAG; XICWAK; XUVBAR; XUVBEV; PATVAL	20	12.6
A3	*syn-anti*	$R_2^2(8)$ dimers forming 2 mutual $C(4)$ chains and intramolecular hydrogen bonds	EFIDIH; YOWRUA	2	1.3
B1	*syn-anti*	Isolated $R_2^2(8)$ dimers and intramolecular hydrogen bonds	BAGYOZ; BASQET; BASQIX; BUDREY; CIQHAN; DECROT; DEWYAG; EFIDON; EJUXAK; FODVAY; FOVMOT; FUQBOK; FUXFAI; FOXFOW; FUXGAJ; GITLAX; GODGUC; GODHAJ; HOXPIU and HOXPIU01; IYONES; KOJQAC; LABMIN; MUCJUQ; MUWYUZ and MUWYUZ01; OCEFAF; OLEXAF; OLEXOT; PULQEV; QAJPOK; REHDOY; ROGKUU; SIZXOR; SIZXUX; TALCOC; TALCUI; TALDAP; TASCEW; TENROV; TENRUB; TUJMOD; UJACUF; UJADAM; UJADEQ; VIVPUM, VIVQAT; XOSDOZ; XOSDUF; XOSFAN; YESZAY; YICHIB and YICHIB01; YICHOH; YIPJIS; ZUCREW; ZUCRIA; QEBJAM; ZUCROG; TIRXUP	57	35.8
B2	*syn-anti*	Isolated $R_2^2(8)$ dimers and intermolecular hydrogen bonds with other atoms	NAQZOY; XAMZEU; BOTLOO; DAPCOP; EBIXIZ; EHIZOM; ETOLAA; GETPAY; GETPEC; GUFGAS; GUKWE01; GUWMUJ; IRASIF; JESXIR; KERQOP; KUGBUK; MOKKON and MOKKON01; MOYPAU; NALFEP; NUPZAP; OHAZOO; PELMIF; PICBIP; PICBUB; PICCAI; RONLIP; TOWFAP; UCETUS; VOMDAF; WIYMEX; TANBAP; EMULAC; LABCUM; QACYIE;	34	21.4
C	*syn-anti*	Isolated $R_2^2(8)$ dimers and intramolecular and intermolecular hydrogen bonds with other atoms	XECHUJ;	1	0.6

Table S5. Types of non-dimeric structures from the CSD search results for phenylboronic acid derivatives.

Synthon type	Conformation	Hydrogen bonding	CSD reference code	Count	%
D	*anti*	Intramolecular	PAQMAX; UJACAL; UPUNUQ	3	9.7
E	*syn-anti*	$R_3^3(8)$ trimers + chains	BEQMER	1	3.2
F	*syn-anti*	Two parallel hydrogen bonded $C(4)$ chains	GURQES; ITIRAE; UJACAL01; VEFCUF; WAJXEL01	5	16.1
G	*syn-anti* / *anti* / *syn*	$C(4)$ chains	BPHBAC; LIXLAG; UJABUE	3	9.7
H	*syn-anti* / *anti* / *syn*	Only hydrogen bonds with other atoms	APOROO; DOBKUA; FUXGIR; GETNEA; GETNIE; GETNOK; HAGDIF, MIDYOO; WUMKAS; XAVHUZ; ZUCRUM	11	35.5
I	*syn-anti*	$C(4)$ chains and hydrogen bonds with other atoms	HIJZEI; NALDUD; VEXFUZ02; PEYLOV; QACYEA	5	16.1
J	*syn-anti* / *anti*	$C(2)$ chains or chains involving other functional groups	MAGMAM; ROKJUX	2	6.5
K	*syn-anti* and *anti*	Isolated and intramolecular hydrogen bonds	UJACIT	1	3.2

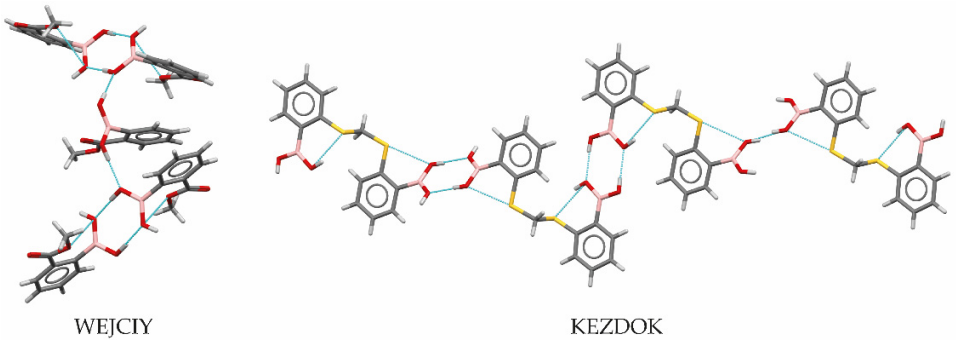


Figure S4. Hydrogen bonding phenylboronic acid derivative structures containing chains and dimers.

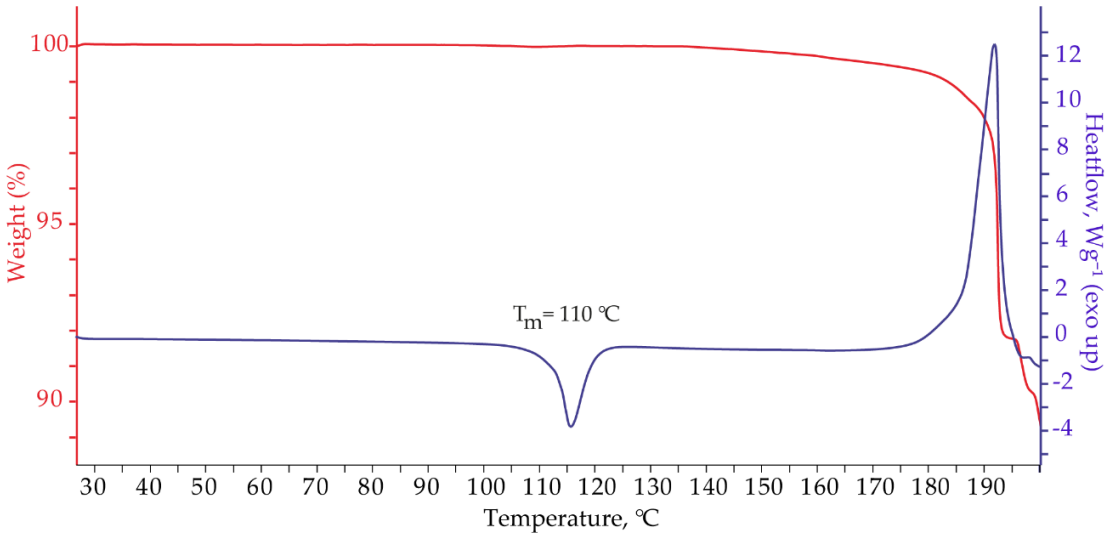


Figure S5. DSC / TG curves of MPBA Form I (heating rate 10 °C min^{-1}). The onset temperatures were used to characterize the thermal process occurring in the DSC traces.

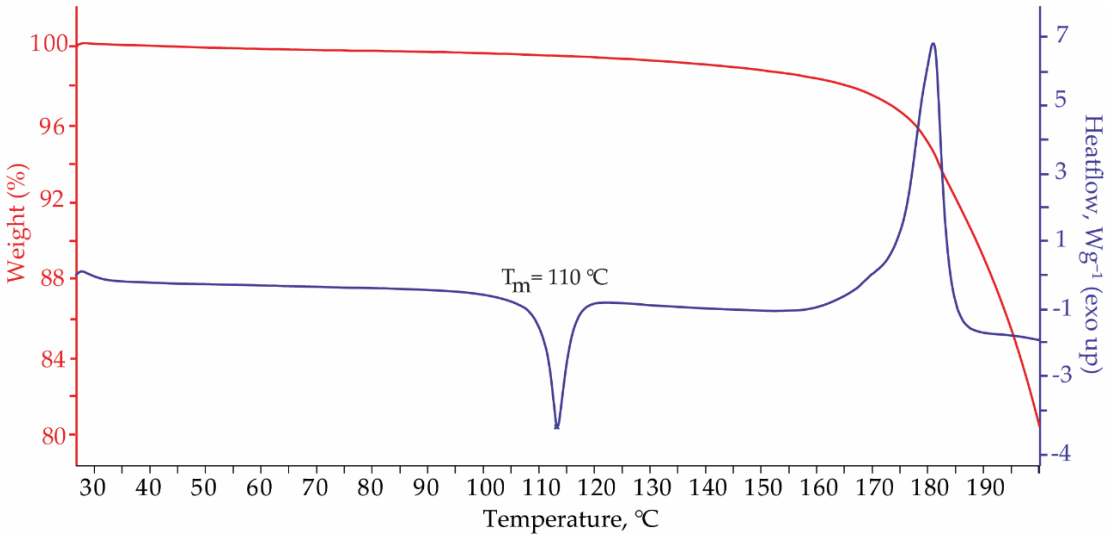


Figure S6. DSC / TG curves of MPBA Form II (heating rate 10 °C min^{-1}). The onset temperatures were used to characterize the thermal process occurring in the DSC traces.

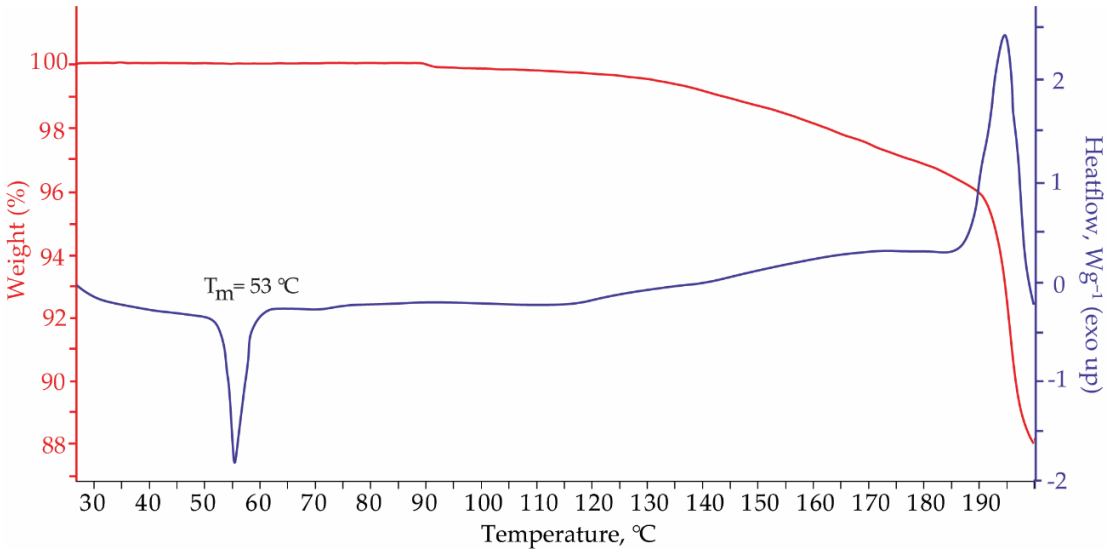


Figure S7. DSC / TG curves of MPBA Form III (heating rate 10 °C min^{-1}). The onset temperatures were used to characterize the thermal process occurring in the DSC traces.

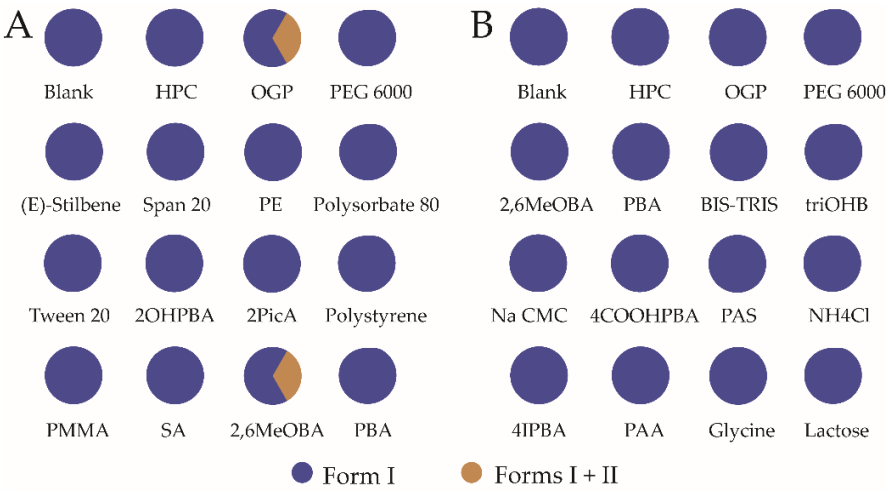
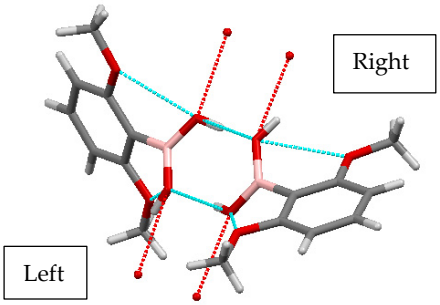
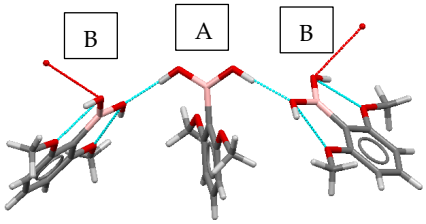
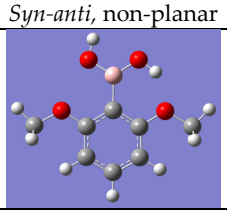
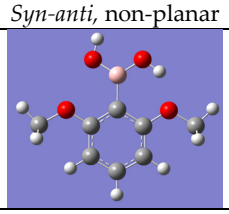
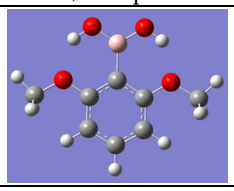
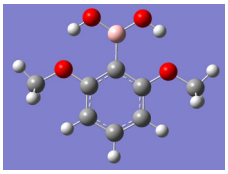
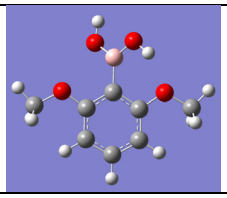
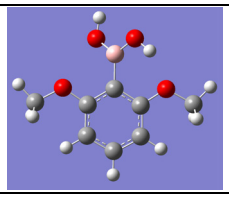
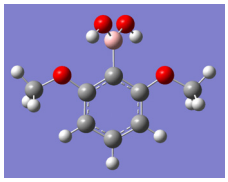
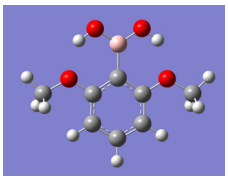


Figure S8. Results of the crystallization in the presence of additives from toluene (A) and water (B). Each 1/3 of the circle represents one of the parallel experiments.

Abbreviations: HPC – hydroxypropyl cellulose; OGP - octyl β-D-glucopyranoside; PEG – polyethylene glycol; PE – polyethene; 2,6MeOBA - 2,6-dimethoxybenzoic acid; PBA – phenylboronic acid; BIS-TRIS – bis(2-hydroxyethyl)amino-tris-(hydroxyethyl)methane; PAA -poly(acrylic amide); 2OHPBA – 2-hydroxyphenylboronic acid; 2PicA – 2-piconilic acid; Na CMC – sodium carboxymethyl cellulose; 4COOHPBA – 4-carboxyphenylboronic acid; PMMA – polymethylmethacrylate; SA – salicylic acid; 4IPBA – 4-iodinepheylboronic acid; triOHB – 1,2,3-trihydroxybenzene; PAS – poly(acrylic acid).

Table S6. Intramolecular energies and torsion angle data of MPBA polymorphs.

	Form I		**Form II**	
Asymmetric unit				
Conformation in crystal structure	Left, *Syn-anti*, non-planar	Right, *Syn-anti*, non-planar	A molecule, *Anti*, non-planar	B molecule, *Anti*, planar
Optimized				
Torsion angle in opt. structure, deg	-12.7	-12.0	4.5	4.6
Constrained optimization				
Torsion angle in constr. opt. structure, deg	-42.1	-46.3	59.8	5.0
ΔE_{opt}, kj·mol^{-1}	11.6	11.6	0	0
$\Delta E_{constr.opt}$, kj·mol^{-1}	15.3	15.1	18.1	0

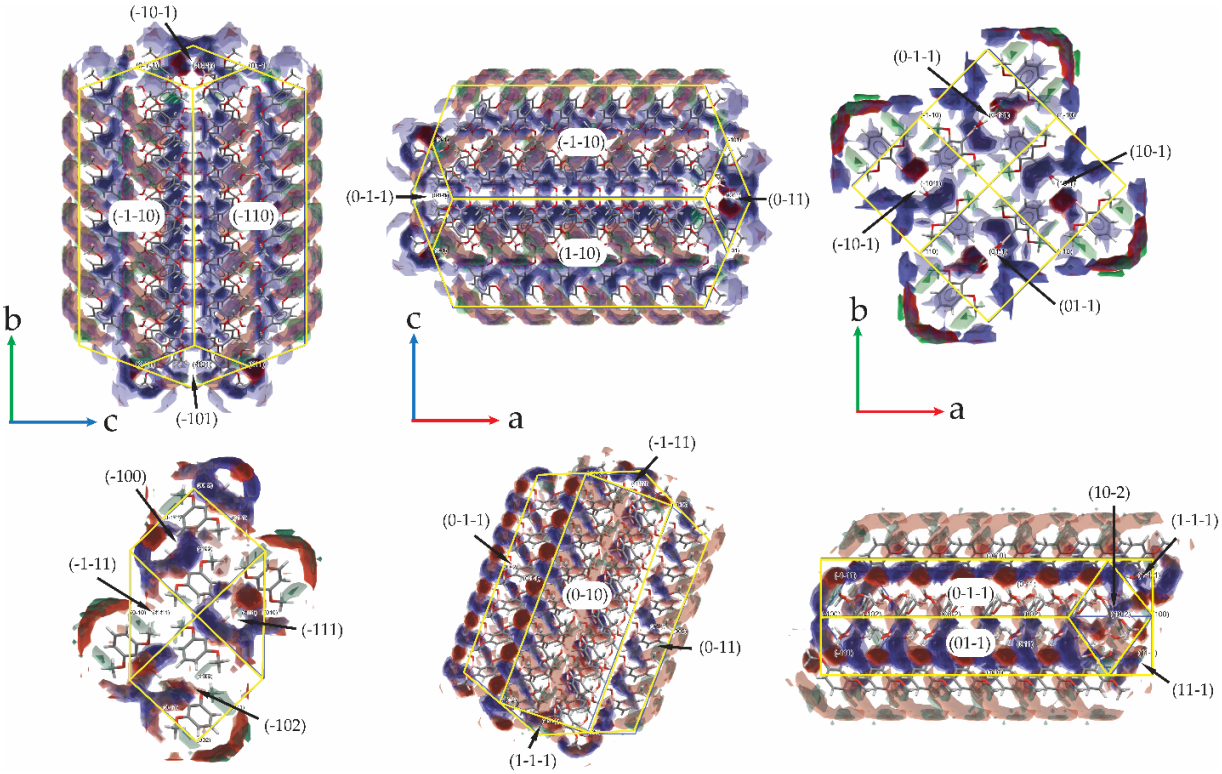


Figure S9. FIMs combined on the BFDH morphology of MPBA $P\bar{4}n2$ Form I (on the top row) and *Pc* Form I (on the bottom row). Regions of hydrogen bond donor probability are shown in blue, hydrogen bond acceptors are shown in red and hydrophobic interactions are shown in green.