Electronic Supplementary Material

Efficient metal-free conversion of glucose to 5-hydroxymethylfurfural using a boronic acid

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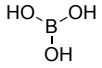
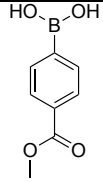
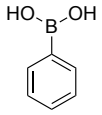
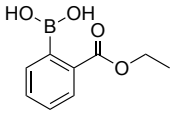
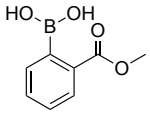
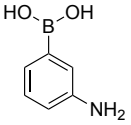
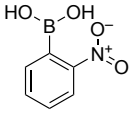
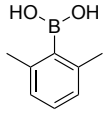
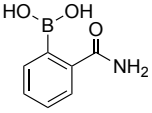
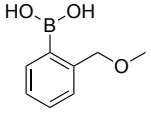
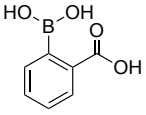
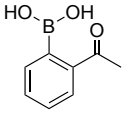
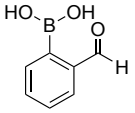
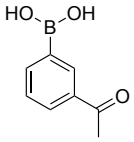
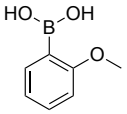
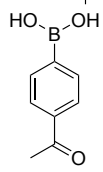
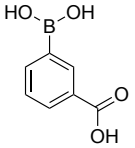
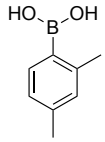
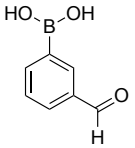
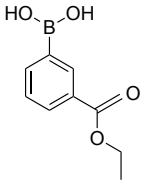
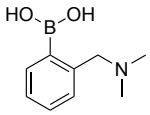
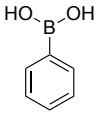
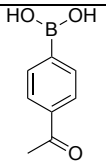
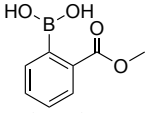
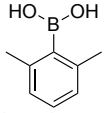
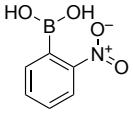
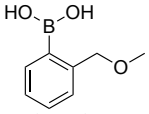
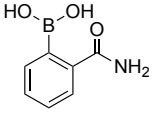
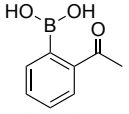
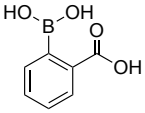
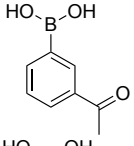
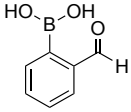
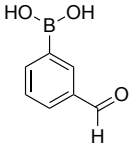
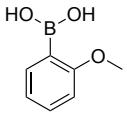
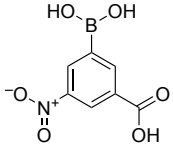
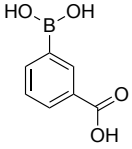
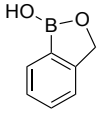
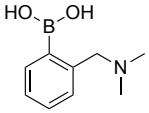
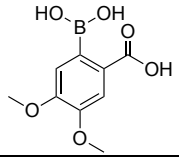
Table S1 Screen of boronic acids for the metal-free conversion of glucose to HMF in [BMIM]Cl.[a]

Boronic acid	HMF Yield (%) (anhydrous)	HMF Yield (%) (aqueous)	Boronic acid	HMF Yield (%) (anhydrous)	HMF Yield (%) (aqueous)
	20.3	0.3		7.0	0.1
	6.9	0		24.5	18.5
	0.4	19.6		3.4	4.5
	15.1	0.2		9.5	0.1
	0.4	2.2		6.6	0.1
	24.1	44.1		8.2	0.6
	23.9	0.5		10.0	0.2
	4.1	0.0		16.3	0.3
	10.6	0.7		1.6	0.1
	12.8	0.3		8.2	0.4
	0	0	None	0.15	0

[a] Reaction conditions: [BMIM]Cl (1.0 g), glucose (10% w/v), and boronic acid (1 equiv), shaken (650 rpm) at 105 °C for 2 h. Two reactions were performed with each boronic acid: one with no added water (anhydrous) and one with added water (60 μL, 12 equiv) to mimic water from the $MgCl_2 \cdot 6H_2O$ (2 equiv) in Caes et al. (2013).

Table S2 Screen of boronic acids for the metal-free conversion of glucose to HMF in DMF.[a]

Boronic Acid	HMF Yield (%)	Boronic Acid	HMF Yield (%)
	0.0		0.0
	3.3		0.0
	0.0		0.0
	0.0		0.0
	58.2		0.0
	0.0		0.0
	0.0		0.0
	0.0		0.0
	0.0		16.3

[a] Reaction conditions: A 0.5-mL solution of DMF containing [BMIM]Cl (0.19 M), glucose (10% w/v), and catalyst (1 equiv); shaken (650 rpm) at 95 °C for 1 h.

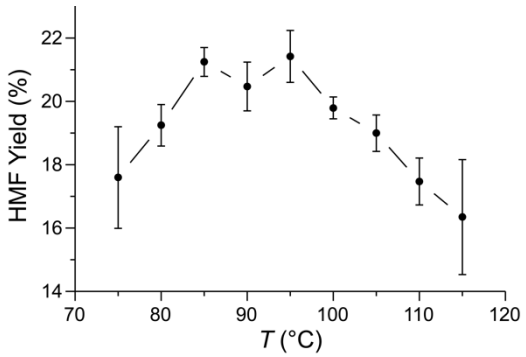


Figure S1 Temperature-dependence of the conversion of glucose to HMF in [BMIM]Cl. Reaction conditions: [BMIM]Cl (1.0 g), glucose (10% w/v), and 2-CPBA (1 equiv), shaken (650 rpm) at the specified temperature for 2 h. n = 4 at each temperature.

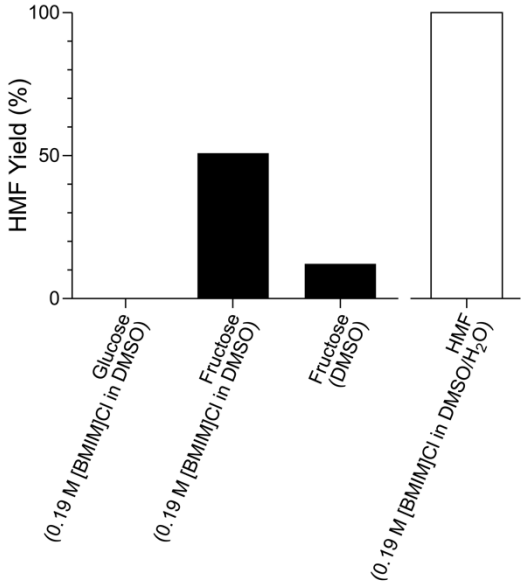


Figure S2 Conversion of sugars in the absence of a boronic acid. Reaction conditions: 1.0 mL of solvent containing sugar (10% w/v), shaken (650 rpm) at 95 °C for 2 h. The solution containing HMF had 0.2 mL of added water to allow for HMF hydrolysis.

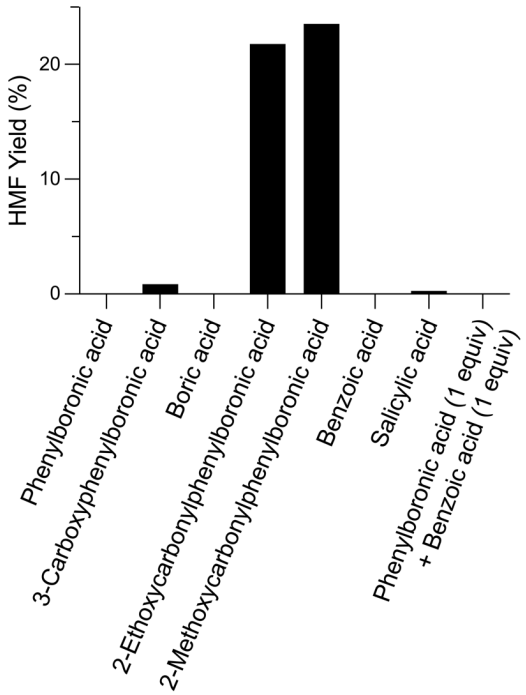


Figure S3 Catalyst screen in DMSO. Reaction conditions: 1.0 mL of DMSO containing [BMIM]Cl (0.19 M), glucose (10% w/v), and catalyst (1 equiv); 95 °C, 1 h, shaking at 650 rpm.