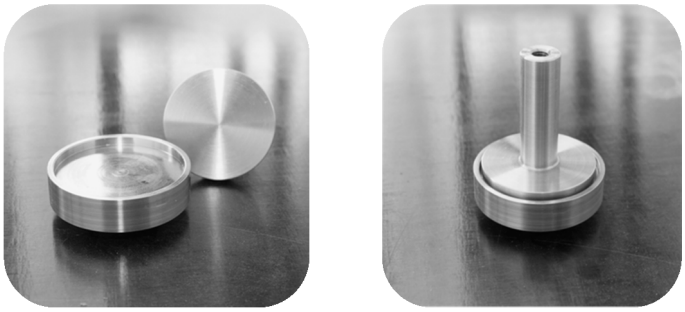
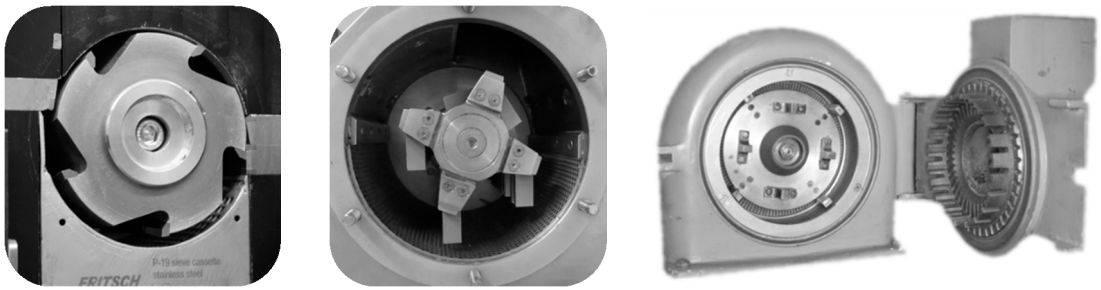
Supplementary Material: Torrefied Biomass Pellets—Comparing Grindability in Different Laboratory Mills

Jan Hari Arti Khalsa, Diana Leistner, Nadja Weller, Leilani I. Darvell and Ben Dooley



(**a**) (**b**)

Figure S1. Picture of the anvil and plunger used during the hardness test: (**a**) Showing the two surfaces between which the pellets are compressed and (**b**) the plunger resting on the anvil without a pellet in-between them.



(**a**) (**b**) (**c**)

Figure S2. View of the grinding chamber of each of the three mills used. In (**a**) the blades of the CM, in (**b**) the flexible hammer elements of the HM and in (**c**) the geometry of the grinding ring inside the IM can be seen.

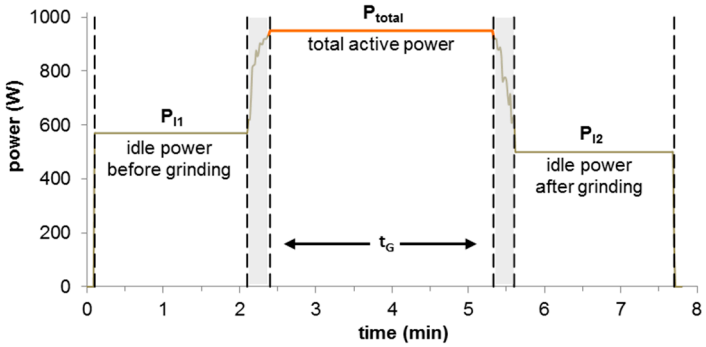


Figure S3. Typical power curve when recoding the power consumption during grinding. Given are the defined parameters necessary for calculating the specific grinding energy.

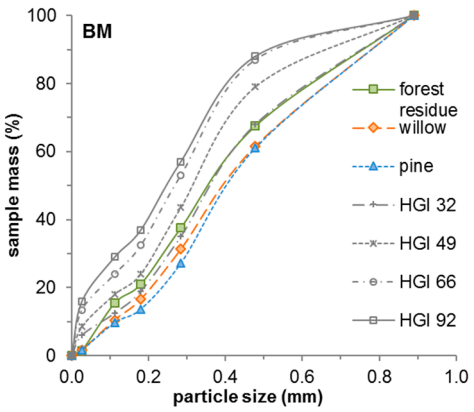


Figure S4. Cumulative particle size distribution obtained when using a ball mill (as prescribed in the HGI method) on three selected torrefied biomass pellets and four standardized HGI coals.

Table S1. Characteristic values of the particle size distributions obtained by the different mills for the different biomass types. Given are the maximum particle sizes (mm) under which a certain fraction of the sample mass, here 10% (x10), 50% (x50) and 90% (x90), is accumulated.

Biomass Type	Impact Mill			Cutting Mill			Hammer Mill		
	x10	x50	x90	x10	x50	x90	x10	x50	x90
Willow	0.13	0.30	0.48	0.11	0.40	0.71	0.09	0.33	0.62
Pine	0.13	0.31	0.56	0.09	0.41	0.69	0.08	0.33	0.62
Beech	0.14	0.32	0.54	0.12	0.42	0.76	0.12	0.34	0.63
Poplar	0.12	0.31	0.49	0.12	0.39	0.69	0.11	0.35	0.64
Spruce	0.09	0.32	0.59	0.10	0.43	0.78	0.09	0.34	0.65
Forest residue	0.14	0.28	0.46	0.09	0.34	0.67	0.07	0.24	0.48
Straw	0.10	0.34	0.62	0.13	0.47	0.82	-	-	-