Supporting Information

Mechanochemistry in the Undergraduate Teaching Laboratory

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Table S1 – Undergraduate mechanochemistry teaching experiments published from 2010-2025,[a] ordered as discussed in main article, briefly summarizing mechanochemical reaction/experiment type, milling method, solvents in workup, and where appropriate the approach to green chemistry student assessments.

Year	First author, last name	Ref. #	Mechanochemical reaction type/summary	Mechanochemical Method(s) [b]	Solvent(s) for workup(s)	Green chemistry assessment(s) [c]
2015	*Golstein*	23	reductive amination	manual grinding (15 min. & 30 min.)	ethyl acetate, ethanol	pre-/post-question(s)
2018	*Cunha*	29	chlorination of acetanilide	manual grinding (10 min.) **or** PM (1.5h, 500 rpm)	ethyl acetate, water, ethanol	metrics (*E-factor*), comparison(s)
2019	*Colacino*	30	sulfonylureas by catalytic coupling	Neat or LAG (CH_3NO_2); MM (2h, 30 Hz) **or** PM (2h, 450 rpm)	water	metrics (*AE, E-factor*), comparison(s)
2019	*Mancheno*	31	covalent organic framework (COF)	manual grinding (5 min. & 15 min. LAG(H_2O))	water, methanol, THF	
2019	*Bastin*	24	amine acylation	manual grinding (10 min., pre-heated)	ethyl acetate	pre-/post-lab question(s), metrics (*AE, EMY, E-factor*) comparison(s)
2022	*Jordan*	25	chalcone by aldol condensation	manual grinding (~10 min.)	water, ethanol	pre-/post-question(s)
2024	*Neto*	34	ketone α-bromination and synthesis of 2-phenylimidazo[1,2-α]pyridine	manual grinding (30 min. & 30 min.) **or** home-made vortex mill (5 min. & 5 min.)	ethyl acetate, water, acetone, hexane	
2025	*Ma*	35	base-catalyzed synthesis of a thiazoline heterocycle	manual grinding (10 min.)	ethanol	pre-/post-question(s)
2025	*Pokharel*	36	reduction of acetylferrocene to (±)-1-ferrocenylethanol	microwave (30 sec.) followed by manual grinding (5 min.); **x3** **or** RT manual grinding (20 min.)	ethyl acetate, water	pre-/post-question(s)

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Table S1 continued…

2025	*Shunnar*	38	**(1)** Cu-NHC synthesis, **(2)** transmetalation to Au-NHC, **(3)** Cu-NHC catalyzed Sonogashira cross-coupling	**(1)** MM (30 min., 25 Hz) **x2** **(2)** MM (30 min., 25 Hz) **x2** **(3)** MM (1h, 25 Hz)	**(1) & (2)** acetone, pentane **(3)** water, DCM	pre-/post-lab question(s), metrics (*AE, RME, OE, MI, E-factor*)
2010	*Berry*	40	Pd phosphine dimer complex	home-made stirrer mill (24 h)	DCM	
2020	*Förster*	41	$CuI(PPh_3)_2L$ (L = py or py^{CN})	manual LAG(DCM) (~5 min.)	tert-butyl methyl ether	pre-/post-lab question(s)
2020	*Yuan*	42	polyoxometalate (POM) guest metal organic framework (POM@MOF) NENU-3	manual LAG(EtOH) (5–10 min.)	water, ethanol	
2023	*Kraft*	43	prussian blue, $KFe^{III}[Fe^{II}(CN)_6]$	manual grinding (up to 5 min.)		
2023	*Nitka*	44	metalloporphyrin synthesis	MM (5 min., 25 Hz) **x3**	ethyl acetate	pre-/post-lab question(s)
2023	*Jenkins*	46	$CuCl_2$ to CuO with NaOH	manual grinding (a few min.)	water	comparison(s)
2023	*Bru*	47	Cu-NHC synthesis	manual grinding (30 min. – 1h) **or** PM (30 min., 400 rpm)	DCM, pentane **or** acetone, heptane/ cyclohexane	metrics (*AE, E-factor, MI, RME, OE, Green Star*), comparison(s)
2024	*Domínguez-Martín*	48	Zn antibiotic coordination framework (Zn-ACF)	manual LAG($NH_{3(aq)}$) (5 min.)	ethanol	
2024	*Dong*	49	$[Ni(Me_3en)(acac)][BPh_4]$ synthesis	manual grinding (10 min.)	water	
2014	*Wixtrom*	50	Polymorphs of charge transfer salt tetrathiafulvalene-chloranil (TTF-CA)	manual LAG (H_2O or acetone) (20 min.)		pre-/post-lab question(s), metrics (*AE, E-factor*)
2017	*Brown*	51	mechanochemical ring-opening of spiropyran (SP) in poly(dimethylsiloxane) (PDMS) elastomer network	hit with hammer, drag blunt object, pull polymer		
2021	*Winum*	52	tribochromism in Maya blue pigments	manual grinding		
2022	*Bychkov*	53	degradation of α-cellulose biopolymer	PM (0 to 960s, 1.1 kW nominal motor power)		
2023	*Silva*	54	naproxen-cimetidine co-amorphous system (NPX-CIM)	MM (60 min., 30 Hz)		
2023	*Hu*	55	2D MoS_2 nanosheets	PM (24 h, 580 rpm)	water	
2024	*Wang*	56	computational COGEF (constrained geometries simulate external force) method			

[a] References 27 and 28, which are book chapters proposing several different mechanochemical syntheses selected from the primary literature are not included or discussed.

[b] *Abbreviations:* PM (planetary mill), MM (mixer mill), LAG (liquid-assisted grinding)

[c] The term "comparison(s)" refers to students comparing the mechanochemical route to alternative syntheses, such as solution-based methods, with an emphasis on green chemistry principles. Blank box means no green chemistry assessments were explicitly reported by the original authors relating to specifically to mechanochemistry.