Electronic Supplementary Material (ESI) for Environmental Science: Water Research & Technology.

Supporting Information for

A review of the impact of testing conditions on the performance and quality control of locally manufactured, point-of-use ceramic water filters

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Table S1: Comparison of point-of-use water treatment strategies

Treatment Technique	Benefits	Limitations
Chemical[1, 2]	✓ Inexpensive ✓ Residual disinfection ✓ Effective against a variety of microorganisms	× Imparts an odor and taste to the water × Low effectiveness in turbid water
Heat[3]	✓ Effective against a variety of microbes ✓ Works in turbid water	× Takes several hours × No residual disinfection × Cost of purchasing fuel can prohibit using this technique
Solar treatment[3]	✓ Simple, inexpensive	× Requires several hours × Only treats small volumes of water in plastic water bottles × Low effectiveness in turbid water × Variable performance depending on the weather × No residual disinfection
Physical[3] **(Specifically CWFs)**	✓ Practical, easy to use ✓ Effective against most microorganisms ✓ Most effective long-term method of household water treatment	× Requires regular cleaning × Lack of trained workers and factories × High cost × Lack a standard quality control

Table S2: Summary of E. coli removal performance data by silver coated CWFs tested in controlled laboratory conditions

Study	Clay source	Burnout material	Filter Shape	Whole filter silver coating	Addition of influent: Influent solution	Sampling Schedule	LRV[a,b] (n=number of CWF units) *Initial bacteria concentration*
4	Cambodia	Rice husks	Straight walls	70 mg $AgNO_3$	Falling head: Well water or rainwater	N.R.	3.0±2.1 (n=6) *10^3-10^4 CFU/mL*
5	Cambodia	Rice husks	Straight walls	110 mg $AgNO_3$	Falling head: Chlorine-free tap water or surface water (Netherlands)	60-85L 125-160L 240-320L	1.7±1.5 1.1±0.4 1.4±0.6 (n=4) *19-290 CFU/100 mL*
6	Cambodia	Rice husks	Straight walls	36 mg $AgNO_3$ 110 mg $AgNO_3$	Constant head: Surface water (Netherlands)	N.R.	1.2±0.5 1.3±0.7 (n=6) *10^4-10^7 CFU/100 mL*
7	Cambodia	Rice husks	Straight walls	110 mg $AgNO_3$	Falling head: Rainwater Surface water (Cambodia)	1340L	2.2±0.80 2.3±0.75 (n=4) *1-540 CFU/100 mL*
8	Red Art clay	Sawdust	Disks	4.96 mg silver per clay disk	Falling head: Phosphate buffer solution	2-4 pore volumes	4.3±1.7 (n=3) *10^{10} MPN/100 mL*
9	Red Art clay	Sawdust	Straight walls	0.3 mg AgNP/g ceramic	Constant head: National Sanitation Foundation challenge water	12 days	3.75±1.1 (n=2) *7.3x10^6 CFU/100 mL*
10	Colombia	N.R.	Straight walls	Colloidal silver[a]	Falling head: Deionized water with additives	18 months	4.5±0.7 (n=1) *9x10^4 CFU/100 mL*
11	Nicaragua	Sawdust	Straight walls	2 mL of 3.2% colloidal silver solution	Falling head: Dechlorinated tap water with *E. coli*	8-120L	3.8±1.1 (n=2) *1.2x10^6 CFU/mL*
12	Indonesia Tanzania Nicaragua	Sawdust	Disks	0.3 mg nAg/g	Constant head: Phosphate buffer solution	7.2L[b]	4.1±0.6 4.3±0.6 3.0±0.7 (n=2) *10^6 CFU/mL*
12	Indonesia Tanzania Nicaragua	Sawdust	Disks	0.3 mg Ag^+/g	Constant head: Phosphate buffer solution	7.2L[b]	6.6±0.1 5.7±1.0 2.5±0.5 n=2 *10^6 CFU/mL*
13	Nicaragua	Sawdust	Straight walls	2 mL of 3.2% colloidal silver solution	Falling head: Surface water (United States)	5 weeks	4.6±2.1 (n=3) *10^6 CFU/mL*

14	Red Art clay	Sawdust	Ovoid	0.3 g Argenol AgNPs	Falling head: EPA synthetic test solution	4 days	10.5±0.15 (n=2) *10^{10} CFU/100 mL*
15	Dominican Republic	Sawdust	Curved walls	Variable amounts of AgNPs	Falling head: WHO Challenge water	8-11 days	5.6±1.7 (n=2) *10^{5} CFU/100 mL*

N.R.-not reported. All LRV are reported for E. coli. When possible, steady state LRV reported. Results from laboratory made ceramics reported when applicable.

[a]Silver concentration not reported.

[b]This study used CWF disks, calculating that the 7.2 L is equivalent to 1300 L passed through a full-scale filter.

Table S3: Effect of water quality parameters on silver release

Parameter	Range	Silver release*	Source	Current understanding of effect on silver release
TDS	10 mM $NaNO_3$	0.1 mg/L	16	Cation exchange can occur on CWFs. Ag^+ is exchanged for cations in the throughput. AgNPs can also be displaced by cations in the throughput.[16, 17]
	50 mM $NaNO_3$	0.8 mg/L		
	10 mM $NaNO_3$	0.1 mg/L		
	10 mM $Ca(NO_3)_2$	0.2 mg/L		
pH	9	0.006 mg/L		
	7	0.100 mg/L		
Chlorine	0 mg/L	0.019 mg/L	18	Oxidation from chlorine leads to enhanced silver dissolution.[18, 19]
	2 mg/L	0.070 mg/L		
NOM	3 mg C/L	0.07 mg/L		NOM coats AgNPs, preventing dissolution and minimizing toxicity.[18, 20]
	0 mg C/L	0.10 mg/L		

*For CWFs coated with silver nanoparticles.

	Assumed Concentration of Reagent (mg/L)								
Reagent	EPA General Phase	EPA Challenge Phase	EPA Leaching Phase	WHO General Phase	WHO Challenge Phase	Reagent cost ($/g reagent)	Reagent supplier	Cost per reagent EPA ($)*	Cost per reagent WHO ($)*
Humic acid	5	10	1	0	20	14.64	Fisher Scientific	30.39	32.21
Tannic acid	0	0	0	2	0	5.63	Fisher Scientific	0.00	2.12
ISO spec 1213-A2 fine test dust	0	330	0	0	330	0.02	Powder Technology	0.57	0.57
Sea salts	500	1650	100	500	1650	0.10	Millipore Sigma	28.47	28.10
Sodium bicarbonate	0	0	0	120	120	0.06	Acros Organics	0.00	2.17
							Total Cost per filter ($)	59.43	65.16

Table S4: Calculations for the cost of the EPA and WHO performance assessments

*Cost values based on 188 L general water, 110 L challenge water, and 36 L leaching water (for USEPA). These volumes are based on the application of the USEPA guide in Shepard *et al*.[14]

All cost calculations are in USD. Reagent costs only, labor and laboratory infrastructure not included.

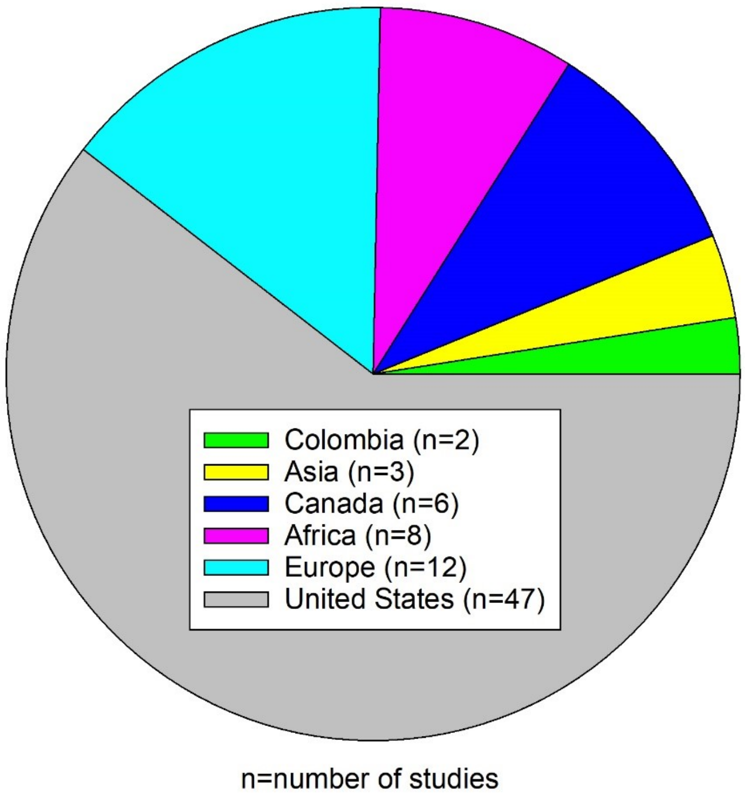

Figure S1: Geographic distribution of publications on CWFs. These values are based on the location of the last author reported in the literature reviewed here. N is equal to the number of studies with a last author from the given location.

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