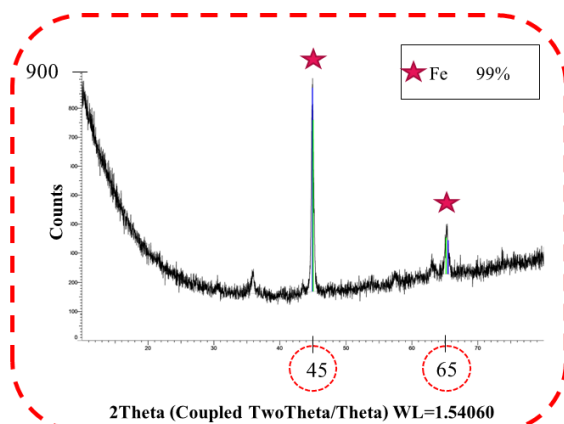
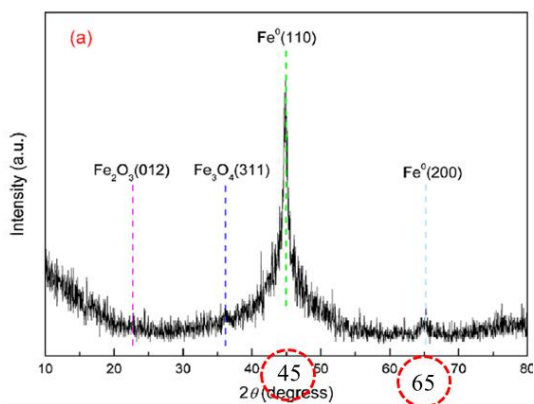


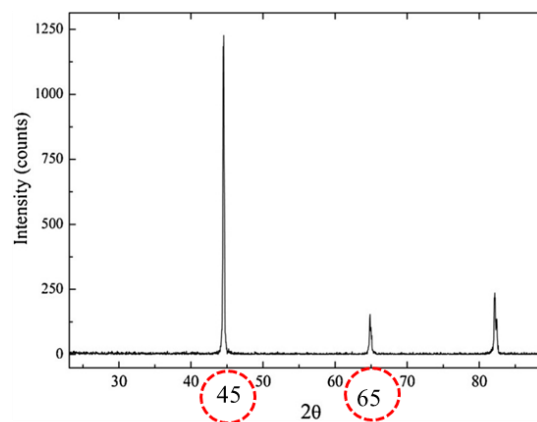
Figure S1. Characterization of synthesized ZVI and its comparison with results from literature.



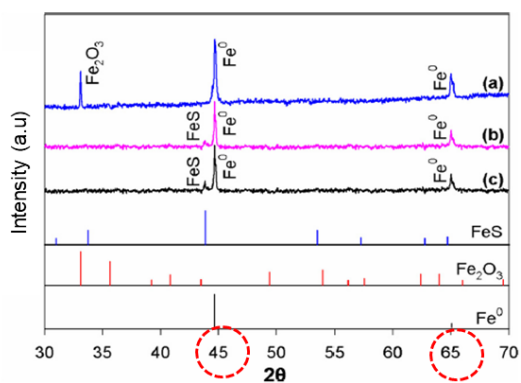
XRD diffractogram from current study



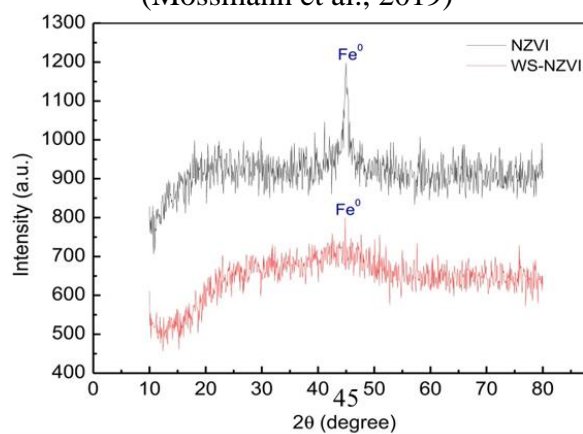
(Dongsheng et al., 2019)



(Mossmann et al., 2019)



(Lü et al., 2019)



(Shao et al., 2018)

Table S1. Comparison of Heat and pH pretreatments effect on biogas production from several anaerobic digestion

Reference	Hydrolysis process	pH	Temp ^o (°C)	Heat treatment (min)	Iron forms	ZVI (m)	Raw materials	Biogas ³ (m ³ /kg TVS)	CH ₄ ³ (m ³ /kg TVS)
This study	heat	5.45	-	-	-	-	Cassaa pulp	0.13	0.03
This study	heat	5.45	100	30	Scarp	2-3x10 ⁻³	Cassaa pulp	0.28	0.09
This study	heat	8	100	30	-	-	Cassaa pulp	3.52	0.82
This study	heat	8	100	30	Scarp	2-3x10 ⁻³	Cassaa pulp	6.02	2.39
This study	heat	9	100	30	-	-	Cassaa pulp	5.22	2.07
This study	heat	9	100	30	Scarp	2-3x10 ⁻³	Cassaa pulp	7.22	3.68
This study	heat	10	100	30	-	-	Cassaa pulp	6.54	2.41
This study	heat	10	100	30	Scarp	2-3x10 ⁻³	Cassaa pulp	9.96	5.35
This study	heat	11	100	30	-	-	Cassaa pulp	5.28	1.87
This study	heat	11	100	30	Scarp	2-3x10 ⁻³	Cassaa pulp	7.40	3.27
Yangin-Gomec et al. (2018)	-	-	-	-	Iron Powder	50x10 ⁻⁹	Excess sludge	-	0.09
(Yang et al., 2018)	-	-	-	-	Iron Powder	0.5-10x10 ⁻⁶	Pig manure	-	0.17
(Abdelsalam et al., 2017)	-	-	-	-	Iron Powder	9±0.3x10 ⁻⁹	Pig manure	-	0.35
(Hu et al., 2015)	-	-	-	-	Iron Powder	1x10 ⁻⁹	Excess sludge	-	0.56
(Feng et al., 2014)	-	-	-	-	Iron Powder	0.2x10 ⁻³	Excess Sludge	-	0.28
(Su et al., 2013)	-	-	-	-	Iron Powder	20x10 ⁻⁹	Excess sludge	-	0.02
Zhang et al., (2013)	Bacteria Cellulose	-	-	-	-	-	Excess sludge	-	0.13
(Sukwanitch, 2011)	heat	13	100	90	-	-	Excess sludge	-	1.21
(Gaewchingduang & Pengthemkeerati, 2010)	Heat	<7	120	60	-	-	Excess sludge	-	0.25
(Zhang et al., 2011)	-	-	-	-	Scarp	8×4×2 x10 ⁻³	Excess sludge	-	1.51

Table S2. Comparison of ZVI pretreatments effect on biogas production from several anaerobic digestion

Reference	Iron concentration	Substrate	Size ZVI (m)	Materials	Biogas (m ³ /kg TVS)	CH ₄ (m ³ /kg TVS)
This study	-	-	-	Cassava Pulp	3.50	1.21
This study	0.92 g/l (40 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	7.78	2.39
This study	1.15 g/l (50 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	8.94	3.77
This study	1.38 g/l (60 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	8.44	2.72
This study	1.61 g/l (70 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	7.76	2.03
This study	1.84 g/l (80 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	5.67	1.59
This study	2.07 g/l (90 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	6.99	1.41
This study	2.30 g/l (100 g/kg TVS)	Scarp	$2-3 \times 10^{-3}$	Cassava Pulp	7.35	1.50
(Yangin-Gomec et al., 2018)	1 g/l	Scarp	50×10^{-9}	Anaerobic community	-	0.09
(Yang et al., 2018)	5 g/l	Scarp	$0.5-10 \times 10^{-6}$	Piggery wastewater	-	0.17
(Abdelsalam et al., 2017)	20 mg/l	Scarp	$9 \pm 0.3 \times 10^{-9}$	Pig manure	-	0.35
(Hu et al., 2015)	5 g/l	Scarp	1×10^{-9}	Anaerobic sludge	-	0.56
(Feng et al., 2014)	20 g/l	Scarp	0.2×10^{-3}	Sludge from UASB	-	0.28
(Su et al., 2013)	10 g/l	Scarp	20×10^{-9}	Sludge	-	0.02
(Zhang et al., 2011)	10 g/l	Scarp	$8 \times 4 \times 2 \times 10^{-3}$	Sludge	-	1.51
(Sukwanitch, 2011)	-	-	-	Cassava Pulp	-	1.21
(Gaewchingduang & Pengthemkeerati, 2010)	-	-	-	Cassava Pulp	-	0.25

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