

# Arsenic immobilization in anaerobic soils by the application of by-product iron materials obtained from the casting industry

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## SUPPLIMENTAL MATERIALS

### **Arsenic immobilization in anaerobic soils by the application of by-product iron materials obtained from the casting industry**

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#### ***Table of Contents***

Figure S1. X-ray Diffraction Patterns of the Fe Materials

Figure S2. Particle-size Distribution of the Fe Materials

Table S1. Time Course of Dissolved Fe in Incubated Soils

Table S2. Time Courses of the Ratios of Dissolved Si and P to As in the Control Soils

Fig. S1 X-ray diffraction patterns of (a) spent steel shot (whole), (b) spent steel shot (<212  $\mu\text{m}$ ), (c) fine spent casting sand (<212  $\mu\text{m}$ ), (d) fine spent casting sand (<212  $\mu\text{m}$ , magnetically separated), (e) residual iron material-1 (<212  $\mu\text{m}$ ), (f) residual iron material-2 (<212  $\mu\text{m}$ ), (g) commercial ferrihydrite (212  $\mu\text{m}$ ) and (h) commercial zero-valent iron (<212  $\mu\text{m}$ ). The relative intensities of (f) and (g) are quintupled to show small peaks. F, ferrihydrite; H, hematite; M, magnetite and/or maghemite; Q, quartz; W, wüstite; Z, zero-valent iron

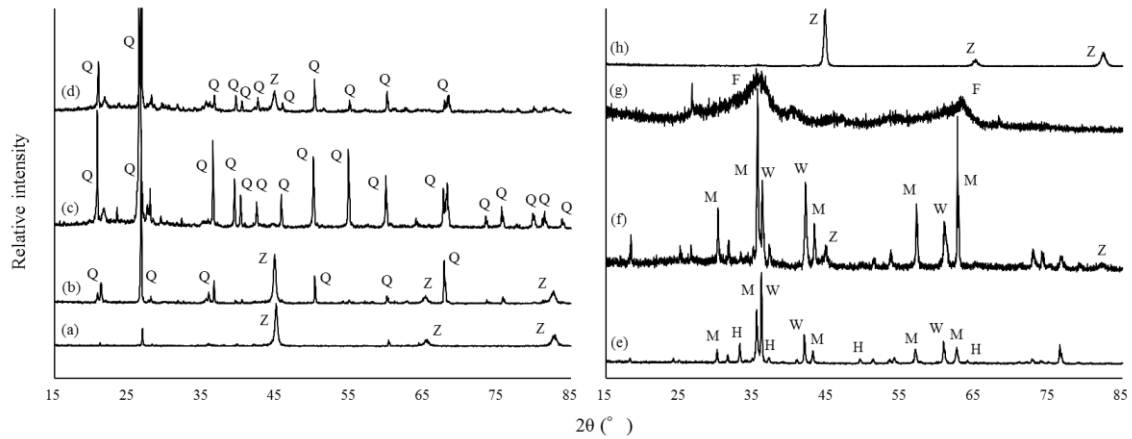


Fig. S2. Cumulative weight of passed particles in the Fe materials. SSS, SCS, RIM, cZVI and cFH denote spent steel shot, fine spent casting sand, residual iron material of steel shot production, commercial zero-valent iron and commercial ferrihydrite, respectively.

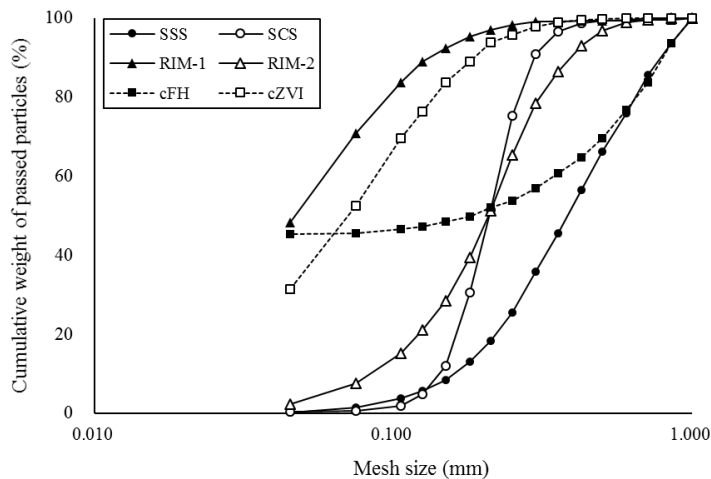


Table S1 Time course of the concentrations of iron (Fe) in soil solution and two-way analysis of variance (ANOVA).

Sample	Approximate incubation time (days)					
	<i>Soil A</i>			<i>Soil B<sub>1</sub></i>		
	20	60	100	20	60	100
<b><i>Dissolved Fe (mg/L)</i></b>						
Cont.	49.8±1.0 a	97.6±1.1 a	109±0 a	85.0±1.5 a	97.5±0.6 a	104±3 a
SSS	71.0±1.0 b	111±4 b	119±3 bc	84.2±2.1 a	97.4±0.6 a	92.2±3.0 b
SCS	51.5±1.7 a	101±1 ac	110±2 a	89.1±1.7 a	102±1 a	100±2 ac
RIM-1	56.6±1.1 c	105±1 c	115±2 ac	86.2±1.1 a	98.2±5.4 a	95.8±0.8 bc
RIM-2	58.8±1.1 c	111±1 b	125±3 b	86.7±1.8 a	98.1±1.4 a	95.3±2.9 bc
cFH	40.9±0.9 d	101±0 ac	147±3 d	67.3±1.1 b	54.8±1.8 b	53.1±0.7 d
cZVI	80.5±1.7 e	73.0±1.0 d	59.6±1.4 e	75.7±5.4 c	83.4±1.2 c	67.0±3.6 e
<i>Two-way ANOVA</i>						
Fe material ( <i>F</i> )	<i>P</i> < 0.001			<i>P</i> < 0.001		
Incubation time ( <i>T</i> )	<i>P</i> < 0.001			<i>P</i> < 0.001		
<i>F</i> × <i>T</i>	<i>P</i> < 0.001			<i>P</i> < 0.001		

SSS, spent steel shot; SCS, fine spent casting sand; RIM, residual iron material of steel shot production; cFH, commercial ferrihydrite; cZVI, commercial zero-valent iron. Values followed by the same letter within a column are not significant (*P* = 0.05, Tukey's test).

Table S2 Time courses of the ratios of dissolved silica (Si) and phosphorus (P) to arsenic (As) in control soils

Ratio	Approximate incubation time (days)		
	20	60	100
<b><i>Soil A</i></b>			
Si/As	30.3	18.4	16.1
P/As	232	150	127
<b><i>Soil B<sub>1</sub></i></b>			
Si/As	369	104	129
P/As	2291	905	1123