**Supporting Information**

**Adaptability of organic matter and solid content to Fe2+/persulfate and skeleton builder conditioner for waste activated sludge dewatering**

Xiaoran Li1, Yafei Shi\* 1, 2, Xi Zhou1, Lu Wang1, Huiqin Zhang1, Kewu Pi1, 2, Andrea R. Gerson3, Defu Liu1, 2

*1 School of Civil Engineering, Architecture and Environment, Hubei University of Technology, Wuhan, Hubei 430068, China*

*2 Hubei Key Laboratory of Ecological Restoration for River-Lakes and Algal Utilization, Wuhan, Hubei, 430068, China*

*3 Blue Minerals Consultancy, Wattle Grove, Tasmania, 7109, Australia*

\*Corresponding at. E-mail: [yfshi@hbut.edu.cn](mailto:yfshi@hbut.edu.cn) (Yafei Shi)

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**Table S1** Optimized experimental schemes and results for sludge with different properties. A-SPS, B-Fe2+ and C-PG are expressed in mg/g DS.

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| **Run** | **Factors and dosages** | | | | | | |  | **Response values** | | | | | | | |
| **A-SPS** | | **B-Fe2+** | | **C-PG** | |  | | **SRF (×1013 m/kg)** | | **Water content of filter cakes (wt%)** | | **Viscosity (Pa·s)** | | | **Organic content of filter cakes (%)** |
| S1-SP-1 | 106.76 | | 23.27 | | 103.35 | |  | | 0.16 | | 82.96 | | 0.35 | | | 33.66 |
| S1-SP-2 | 140.00 | | 15.00 | | 100.00 | |  | | 0.61 | | 84.84 | | 0.47 | | | 33.73 |
| S1-SP-3 | 106.76 | | 23.27 | | 103.35 | |  | | 0.16 | | 82.85 | | 0.32 | | | 33.85 |
| S1-SP-4 | 140.00 | | 30.00 | | 100.00 | |  | | 0.11 | | 81.95 | | 0.34 | | | 34.33 |
| S1-SP-5 | 138.80 | | 23.25 | | 210.00 | |  | | 0.07 | | 81.56 | | 0.41 | | | 31.79 |
| S1-SP-6 | 138.80 | | 23.25 | | 210.00 | |  | | 0.08 | | 80.10 | | 0.42 | | | 32.02 |
| S1-S-P-7 | 117.50 | | 30.00 | | 300.00 | |  | | 0.07 | | 79.60 | | 0.51 | | | 30.03 |
| S1-SP-8 | 106.70 | | 25.73 | | 210.00 | |  | | 0.08 | | 80.82 | | 0.48 | | | 31.35 |
| S1-SP-9 | 140.00 | | 15.00 | | 300.00 | |  | | 0.38 | | 79.22 | | 0.53 | | | 29.67 |
| S1-SP-10 | 137.00 | | 15.75 | | 200.00 | |  | | 0.42 | | 81.01 | | 0.46 | | | 31.41 |
| S1-SP-11 | 80.00 | | 20.55 | | 300.00 | |  | | 0.17 | | 80.49 | | 0.48 | | | 30.13 |
| S1-SP-12 | 107.00 | | 15.38 | | 210.00 | |  | | 0.45 | | 81.81 | | 0.49 | | | 31.43 |
| S1-SP-13 | 80.00 | | 21.00 | | 180.00 | |  | | 0.29 | | 81.38 | | 0.39 | | | 32.14 |
| S1-SP-14 | 80.00 | | 15.00 | | 100.00 | |  | | 0.66 | | 83.08 | | 0.47 | | | 33.67 |
| S1-SP-15 | 114.80 | | 20.78 | | 300.00 | |  | | 0.08 | | 81.36 | | 0.51 | | | 29.92 |
| S1-SP-16 | 137.00 | | 22.50 | | 109.28 | |  | | 0.15 | | 82.45 | | 0.36 | | | 33.33 |
| S1-SP-17 | 107.00 | | 15.38 | | 210.00 | |  | | 0.43 | | 81.37 | | 0.47 | | | 31.35 |
| S1-SP-18 | 80.00 | | 30.00 | | 174.00 | |  | | 0.26 | | 81.24 | | 0.43 | | | 32.27 |
| **Run** | | **Factors and dosages** | | | | |  | | | **Response values** | | | | | | |
| **A-SPS** | | **B-Fe2+** | | **C-PG** |  | | | **SRF (×1013 m/kg)** | | **Water content of filter cakes (wt%)** | | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** | |
| S2-SP-1 | | 106.76 | | 23.27 | | 103.35 |  | | | 0.11 | | 83.52 | | 0.38 | 37.85 | |
| S2-SP-2 | | 140.00 | | 15.00 | | 100.00 |  | | | 0.14 | | 80.78 | | 0.39 | 37.80 | |
| S2-SP-3 | | 106.76 | | 23.27 | | 103.35 |  | | | 0.11 | | 81.72 | | 0.45 | 37.88 | |
| S2-SP-4 | | 140.00 | | 30.00 | | 100.00 |  | | | 0.11 | | 81.57 | | 0.37 | 38.05 | |
| S2-SP-5 | | 138.80 | | 23.25 | | 210.00 |  | | | 0.07 | | 80.23 | | 0.52 | 35.35 | |
| S2-SP-6 | | 138.80 | | 23.25 | | 210.00 |  | | | 0.06 | | 80.60 | | 0.51 | 35.45 | |
| S2-S-P-7 | | 117.50 | | 30.00 | | 300.00 |  | | | 0.04 | | 81.60 | | 0.58 | 33.39 | |
| S2-SP-8 | | 106.70 | | 25.73 | | 210.00 |  | | | 0.05 | | 82.06 | | 0.55 | 35.19 | |
| S2-SP-9 | | 140.00 | | 15.00 | | 300.00 |  | | | 0.05 | | 82.12 | | 0.66 | 33.50 | |
| S2-SP-10 | | 137.00 | | 15.75 | | 200.00 |  | | | 0.08 | | 84.91 | | 0.53 | 35.50 | |
| S2-SP-11 | | 80.00 | | 20.55 | | 300.00 |  | | | 0.04 | | 82.70 | | 0.64 | 33.56 | |
| S2-SP-12 | | 107.00 | | 15.38 | | 210.00 |  | | | 0.07 | | 81.53 | | 0.54 | 35.28 | |
| S2-SP-13 | | 80.00 | | 21.00 | | 180.00 |  | | | 0.09 | | 81.77 | | 0.56 | 35.79 | |
| S2-SP-14 | | 80.00 | | 15.00 | | 100.00 |  | | | 0.17 | | 82.16 | | 0.42 | 38.40 | |
| S2-SP-15 | | 114.80 | | 20.78 | | 300.00 |  | | | 0.03 | | 81.67 | | 0.56 | 33.61 | |
| S2-SP-16 | | 137.00 | | 22.50 | | 109.28 |  | | | 0.10 | | 81.23 | | 0.42 | 37.76 | |
| S2-SP-17 | | 107.00 | | 15.38 | | 210.00 |  | | | 0.08 | | 78.06 | | 0.53 | 35.22 | |
| S2-SP-18 | | 80.00 | | 30.00 | | 174.00 |  | | | 0.09 | | 81.12 | | 0.52 | 35.98 | |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S3-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.23 | 82.54 | 0.44 | 38.81 |
| S3-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.56 | 82.53 | 0.43 | 39.40 |
| S3-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.25 | 81.92 | 0.46 | 38.88 |
| S3-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.16 | 82.21 | 0.35 | 39.13 |
| S2-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.07 | 81.78 | 0.47 | 35.04 |
| S3-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.07 | 81.42 | 0.45 | 35.50 |
| S3-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.10 | 80.03 | 0.60 | 33.57 |
| S3-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.16 | 81.32 | 0.53 | 35.70 |
| S3-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.32 | 79.79 | 0.55 | 33.42 |
| S3-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.35 | 80.47 | 0.48 | 35.39 |
| S3-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.33 | 79.58 | 0.60 | 33.70 |
| S3-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.38 | 81.00 | 0.48 | 35.33 |
| S3-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.43 | 81.90 | 0.51 | 37.17 |
| S3-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.70 | 86.20 | 0.50 | 38.97 |
| S3-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.07 | 80.65 | 0.51 | 35.02 |
| S3-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.17 | 83.11 | 0.38 | 39.28 |
| S3-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.38 | 81.06 | 0.47 | 34.96 |
| S3-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.47 | 81.26 | 0.53 | 37.31 |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S4-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.25 | 82.26 | 0.44 | 40.53 |
| S4-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.43 | 80.73 | 0.40 | 41.12 |
| S4-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.22 | 81.87 | 0.45 | 40.92 |
| S4-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.21 | 82.37 | 0.39 | 40.97 |
| S4-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.10 | 78.37 | 0.48 | 38.03 |
| S4-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.12 | 79.96 | 0.49 | 38.03 |
| S4-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.08 | 80.12 | 0.61 | 35.32 |
| S4-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.12 | 82.22 | 0.55 | 37.07 |
| S4-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.24 | 78.93 | 0.57 | 35.18 |
| S4-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.28 | 79.88 | 0.50 | 37.49 |
| S4-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.27 | 81.30 | 0.63 | 35.13 |
| S4-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.33 | 79.21 | 0.51 | 37.72 |
| S4-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.43 | 80.47 | 0.52 | 37.71 |
| S4-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.70 | 84.90 | 0.48 | 40.33 |
| S4-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.07 | 79.72 | 0.58 | 35.55 |
| S4-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.19 | 82.53 | 0.42 | 39.85 |
| S4-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.32 | 79.44 | 0.50 | 37.29 |
| S4-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.42 | 81.49 | 0.54 | 38.11 |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S5-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.17 | 82.91 | 4.59 | 35.28 |
| S5-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.23 | 82.48 | 4.70 | 36.05 |
| S5-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.19 | 82.66 | 5.39 | 35.44 |
| S5-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.17 | 82.12 | 6.01 | 36.12 |
| S5-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.10 | 82.65 | 7.60 | 33.24 |
| S5-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.09 | 82.11 | 7.75 | 33.51 |
| S5-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.06 | 83.13 | 6.65 | 30.57 |
| S5-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.10 | 83.13 | 7.22 | 32.74 |
| S5-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.08 | 81.61 | 5.32 | 30.26 |
| S5-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.12 | 83.05 | 7.47 | 32.82 |
| S5-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.08 | 82.61 | 7.81 | 30.14 |
| S5-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.09 | 82.69 | 6.32 | 32.43 |
| S5-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.14 | 83.28 | 7.42 | 33.42 |
| S5-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.18 | 83.53 | 4.65 | 36.18 |
| S5-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.06 | 82.32 | 7.58 | 30.95 |
| S5-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.18 | 82.94 | 4.81 | 35.39 |
| S5-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.10 | 83.39 | 8.12 | 32.47 |
| S5-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.17 | 82.81 | 6.83 | 33.33 |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S6-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.14 | 82.91 | 0.44 | 35.78 |
| S6-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.27 | 80.99 | 0.49 | 36.11 |
| S6-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.14 | 82.67 | 0.46 | 35.82 |
| S6-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.14 | 80.94 | 0.47 | 36.18 |
| S6-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.07 | 82.02 | 0.68 | 33.04 |
| S6-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.07 | 81.61 | 0.68 | 32.80 |
| S6-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.06 | 80.34 | 0.79 | 31.36 |
| S6-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.06 | 83.05 | 0.67 | 33.07 |
| S6-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.05 | 80.99 | 0.79 | 31.29 |
| S6-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.11 | 82.28 | 0.68 | 33.45 |
| S6-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.07 | 82.24 | 0.84 | 31.04 |
| S6-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.09 | 81.91 | 0.71 | 32.79 |
| S6-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.11 | 81.82 | 0.64 | 33.67 |
| S6-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.22 | 82.48 | 0.50 | 35.64 |
| S6-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.04 | 81.05 | 0.81 | 31.19 |
| S6-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.18 | 81.67 | 0.47 | 35.79 |
| S6-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.08 | 82.76 | 0.73 | 33.04 |
| S6-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.07 | 84.08 | 0.61 | 33.85 |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S7-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.15 | 81.65 | 0.20 | 36.45 |
| S7-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.39 | 78.72 | 0.21 | 36.50 |
| S7-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.14 | 83.83 | 0.19 | 36.85 |
| S7-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.14 | 82.46 | 0.18 | 35.68 |
| S7-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.09 | 82.16 | 0.22 | 35.85 |
| S7-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.08 | 82.69 | 0.22 | 34.08 |
| S7-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.05 | 80.97 | 0.25 | 32.70 |
| S7-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.09 | 83.50 | 0.23 | 35.27 |
| S7-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.12 | 80.01 | 0.29 | 32.25 |
| S7-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.27 | 78.83 | 0.24 | 35.93 |
| S7-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.07 | 80.84 | 0.32 | 33.09 |
| S7-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.26 | 79.39 | 0.26 | 36.41 |
| S7-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.19 | 80.31 | 0.21 | 35.98 |
| S7-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.39 | 81.52 | 0.22 | 36.32 |
| S7-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.03 | 81.50 | 0.29 | 32.77 |
| S7-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.16 | 81.37 | 0.20 | 37.56 |
| S7-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.26 | 80.59 | 0.25 | 35.44 |
| S7-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.15 | 80.43 | 0.23 | 35.21 |

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| **Run** | **Factors and dosages** | | |  | **Response values** | | | |
| **A-SPS** | **B-Fe2+** | **C-PG** |  | **SRF (×1013 m/kg)** | **Water content of filter cakes (wt%)** | **Viscosity (Pa·s)** | **Organic content of filter cakes (%)** |
| S8-SP-1 | 106.76 | 23.27 | 103.35 |  | 0.14 | 81.15 | 0.29 | 36.25 |
| S8-SP-2 | 140.00 | 15.00 | 100.00 |  | 0.44 | 77.42 | 0.29 | 35.93 |
| S8-SP-3 | 106.76 | 23.27 | 103.35 |  | 0.13 | 81.38 | 0.29 | 36.49 |
| S8-SP-4 | 140.00 | 30.00 | 100.00 |  | 0.13 | 81.26 | 0.27 | 36.60 |
| S8-SP-5 | 138.80 | 23.25 | 210.00 |  | 0.13 | 81.66 | 0.28 | 35.01 |
| S8-SP-6 | 138.80 | 23.25 | 210.00 |  | 0.12 | 79.31 | 0.29 | 35.05 |
| S8-S-P-7 | 117.50 | 30.00 | 300.00 |  | 0.07 | 82.24 | 0.32 | 32.86 |
| S8-SP-8 | 106.70 | 25.73 | 210.00 |  | 0.11 | 81.63 | 0.30 | 34.87 |
| S8-SP-9 | 140.00 | 15.00 | 300.00 |  | 0.32 | 75.18 | 0.30 | 33.86 |
| S8-SP-10 | 137.00 | 15.75 | 200.00 |  | 0.37 | 78.77 | 0.28 | 34.58 |
| S8-SP-11 | 80.00 | 20.55 | 300.00 |  | 0.13 | 81.68 | 0.38 | 33.61 |
| S8-SP-12 | 107.00 | 15.38 | 210.00 |  | 0.37 | 75.76 | 0.30 | 34.59 |
| S8-SP-13 | 80.00 | 21.00 | 180.00 |  | 0.20 | 82.08 | 0.32 | 35.12 |
| S8-SP-14 | 80.00 | 15.00 | 100.00 |  | 0.47 | 77.70 | 0.29 | 35.71 |
| S8-SP-15 | 114.80 | 20.78 | 300.00 |  | 0.06 | 79.39 | 0.34 | 33.33 |
| S8-SP-16 | 137.00 | 22.50 | 109.28 |  | 0.15 | 80.01 | 0.29 | 36.03 |
| S8-SP-17 | 107.00 | 15.38 | 210.00 |  | 0.39 | 78.41 | 0.30 | 34.69 |
| S8-SP-18 | 80.00 | 30.00 | 174.00 |  | 0.17 | 77.21 | 0.30 | 35.13 |

**Table S2** Variance analysis and tables of significance of regression coefficients based on quadratic surface models for sludge with different properties.

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| --- | --- | --- | --- | --- | --- | --- |
| **S1** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.63 | 9 | 0.070 | 487.84 | ＜0.0001 | *significant* |
| A-SPS | 0.029 | 1 | 0.029 | 201.87 | ＜0.0001 |  |
| B-Fe2+ | 0.24 | 1 | 0.24 | 1652.27 | ＜0.0001 |  |
| C-PG | 0.042 | 1 | 0.042 | 292.76 | ＜0.0001 |  |
| AB | 4.19×10─3 | 1 | 4.19×10─3 | 29.15 | 0.0006 |  |
| AC | 3.91×10─5 | 1 | 3.91×10─5 | 0.27 | 0.6159 |  |
| BC | 8.78×10─3 | 1 | 8.78×10─3 | 61.11 | ＜0.0001 |  |
| A2 | 8.22×10─3 | 1 | 8.22×10─3 | 57.19 | ＜0.0001 |  |
| B2 | 0.12 | 1 | 0.12 | 835.07 | ＜0.0001 |  |
| C2 | 2.38×10─4 | 1 | 2.38×10─4 | 1.66 | 0.2337 |  |
| Residual | 1.15×10─3 | 8 | 1.44×10─4 |  |  |  |
| Lack of Fit | 9.87×10─4 | 5 | 1.97×10─4 | 3.64 | 0.1585 | *not significant* |
| Pure Error | 1.63×10─4 | 3 | 5.43×10─5 |  |  |  |
| Cor Total | 0.63 | 17 |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **S2** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.023 | 9 | 2.54×10─3 | 366.20 | ＜0.0001 | *significant* |
| A-SPS | 1.85×10─4 | 1 | 1.85×10─4 | 26.66 | 0.0009 |  |
| B-Fe2+ | 4.68×10─4 | 1 | 4.68×10─4 | 67.59 | ＜0.0001 |  |
| C-PG | 0.015 | 1 | 0.015 | 2213.38 | ＜0.0001 |  |
| AB | 8.48×10─5 | 1 | 8.48×10─5 | 12.24 | 0.0081 |  |
| AC | 1.64×10─4 | 1 | 1.64×10─4 | 23.63 | 0.0013 |  |
| BC | 2.94×10─4 | 1 | 2.94×10─4 | 42.46 | 0.0002 |  |
| A2 | 4.71×10─4 | 1 | 4.71×10─4 | 67.98 | ＜0.0001 |  |
| B2 | 4.67×10─4 | 1 | 4.67×10─4 | 67.38 | ＜0.0001 |  |
| C2 | 3.25×10─4 | 1 | 3.25×10─4 | 46.89 | 0.0001 |  |
| Residual | 5.54×10─5 | 8 | 6.92×10─6 |  |  |  |
| Lack of Fit | 4.31×10─5 | 5 | 8.63×10─6 | 2.11 | 0.2856 | *not significant* |
| Pure Error | 1.22×10─5 | 3 | 4.08×10─6 |  |  |  |
| Cor Total | 0.023 | 17 |  |  |  |  |

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| **S3** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.55 | 9 | 0.061 | 192.57 | ＜0.0001 | *significant* |
| A-SPS | 0.17 | 1 | 0.17 | 531.81 | ＜0.0001 |  |
| B-Fe2+ | 0.095 | 1 | 0.095 | 301.10 | ＜0.0001 |  |
| C-PG | 0.056 | 1 | 0.056 | 179.43 | ＜0.0001 |  |
| AB | 0.013 | 1 | 0.013 | 40.96 | 0.0002 |  |
| AC | 1.88×10─4 | 1 | 1.88×10─4 | 0.60 | 0.4619 |  |
| BC | 4.25×10─3 | 1 | 4.25×10─3 | 13.50 | 0.0063 |  |
| A2 | 0.029 | 1 | 0.029 | 91.18 | ＜0.0001 |  |
| B2 | 0.078 | 1 | 0.078 | 246.69 | ＜0.0001 |  |
| C2 | 7.35×10─4 | 1 | 7.35×10─4 | 2.34 | 0.1649 |  |
| Residual | 2.52×10─3 | 8 | 3.15×10─4 |  |  |  |
| Lack of Fit | 2.19×10─3 | 5 | 4.38×10─4 | 4.04 | 0.1399 | *not significant* |
| Pure Error | 3.25×10─4 | 3 | 1.08×10─4 |  |  |  |
| Cor Total | 0.55 | 17 |  |  |  |  |

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| **S4** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.43 | 9 | 0.048 | 245.23 | ＜0.0001 | *significant* |
| A-SPS | 0.12 | 1 | 0.12 | 610.82 | ＜0.0001 |  |
| B-Fe2+ | 0.058 | 1 | 0.058 | 294.90 | ＜0.0001 |  |
| C-PG | 0.074 | 1 | 0.074 | 381.04 | ＜0.0001 |  |
| AB | 3.93×10─6 | 1 | 3.93×10─6 | 0.020 | 0.8907 |  |
| AC | 2.71×10─3 | 1 | 2.71×10─3 | 13.87 | 0.0058 |  |
| BC | 1.97×10─3 | 1 | 1.97×10─3 | 10.10 | 0.0130 |  |
| A2 | 0.042 | 1 | 0.042 | 214.85 | ＜0.0001 |  |
| B2 | 0.043 | 1 | 0.043 | 220.01 | ＜0.0001 |  |
| C2 | 2.40×10─5 | 1 | 2.40×10─5 | 0.12 | 0.7350 |  |
| Residual | 1.56×10─3 | 8 | 1.96×10─4 |  |  |  |
| Lack of Fit | 9.84×10─4 | 5 | 1.97×10─4 | 1.02 | 0.5293 | *not significant* |
| Pure Error | 5.81×10─4 | 3 | 1.94×10─4 |  |  |  |
| Cor Total | 0.43 | 17 |  |  |  |  |

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| **S5** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.042 | 9 | 4.69×10─3 | 84.45 | ＜0.0001 | *significant* |
| A-SPS | 8.57×10─4 | 1 | 8.57×10─4 | 15.42 | 0.0044 |  |
| B-Fe2+ | 7.10×10─5 | 1 | 7.10×10─5 | 1.28 | 0.2911 |  |
| C-PG | 0.030 | 1 | 0.030 | 543.11 | ＜0.0001 |  |
| AB | 3.25×10─3 | 1 | 3.25×10─3 | 58.57 | ＜0.0001 |  |
| AC | 2.94×10─4 | 1 | 2.94×10─4 | 5.28 | 0.0506 |  |
| BC | 1.48×10─4 | 1 | 1.48×10─4 | 2.67 | 0.1409 |  |
| A2 | 6.53×10─4 | 1 | 6.53×10─4 | 11.75 | 0.0090 |  |
| B2 | 4.89×10─5 | 1 | 4.89×10─5 | 0.88 | 0.3756 |  |
| C2 | 1.55×10─3 | 1 | 1.55×10─3 | 27.82 | 0.0008 |  |
| Residual | 4.44×10─4 | 8 | 5.56×10─5 |  |  |  |
| Lack of Fit | 2.52×10─4 | 5 | 5.05×10─5 | 0.79 | 0.6205 | *not significant* |
| Pure Error | 1.92×10─4 | 3 | 6.40×10─5 |  |  |  |
| Cor Total | 0.043 | 17 |  |  |  |  |

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| **S6** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.064 | 9 | 7.13×10─3 | 171.53 | ＜0.0001 | *significant* |
| A-SPS | 2.48×10─5 | 1 | 2.48×10─5 | 0.60 | 0.4619 |  |
| B-Fe2+ | 4.00×10─3 | 1 | 4.00×10─3 | 96.25 | ＜0.0001 |  |
| C-PG | 0.027 | 1 | 0.027 | 654.57 | ＜0.0001 |  |
| AB | 1.56×10─4 | 1 | 1.56×10─4 | 3.76 | 0.0883 |  |
| AC | 1.11×10─3 | 1 | 1.11×10─3 | 26.65 | 0.0009 |  |
| BC | 6.03×10─3 | 1 | 6.03×10─3 | 145.19 | ＜0.0001 |  |
| A2 | 1.14×10─3 | 1 | 1.14×10─3 | 27.38 | 0.0008 |  |
| B2 | 1.51×10─4 | 1 | 1.51×10─4 | 3.64 | 0.0929 |  |
| C2 | 4.27×10─3 | 1 | 4.27×10─3 | 102.72 | ＜0.0001 |  |
| Residual | 3.32×10─4 | 8 | 4.15×10─5 |  |  |  |
| Lack of Fit | 2.87×10─4 | 5 | 5.74×10─5 | 3.79 | 0.1510 | *not significant* |
| Pure Error | 4.54×10─5 | 3 | 1.51×10─5 |  |  |  |
| Cor Total | 0.064 | 17 |  |  |  |  |

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| **S7** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.19 | 9 | 0.022 | 250.28 | ＜0.0001 | *significant* |
| A-SPS | 2.68×10─3 | 1 | 2.68×10─3 | 31.08 | 0.0005 |  |
| B-Fe2+ | 0.056 | 1 | 0.056 | 654.05 | ＜0.0001 |  |
| C-PG | 0.047 | 1 | 0.047 | 539.69 | ＜0.0001 |  |
| AB | 5.24×10─6 | 1 | 5.24×10─6 | 0.061 | 0.8116 |  |
| AC | 1.19×10─3 | 1 | 1.19×10─3 | 13.78 | 0.0059 |  |
| BC | 7.89×10─3 | 1 | 7.89×10─3 | 91.38 | ＜0.0001 |  |
| A2 | 4.69×10─4 | 1 | 4.69×10─4 | 5.43 | 0.0481 |  |
| B2 | 0.028 | 1 | 0.028 | 323.12 | ＜0.0001 |  |
| C2 | 2.58×10─3 | 1 | 2.58×10─3 | 29.85 | 0.0006 |  |
| Residual | 6.91×10─4 | 8 | 8.63×10─5 |  |  |  |
| Lack of Fit | 6.27×10─4 | 5 | 1.26×10─4 | 5.96 | 0.0863 | *not significant* |
| Pure Error | 6.32×10─5 | 3 | 2.11×10─5 |  |  |  |
| Cor Total | 0.20 | 17 |  |  |  |  |

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| **S8** | **Sum of Squares** | **df** | **Mean Square** | **F Value** | **p-value Prob > F** |  |
| Model | 0.31 | 9 | 0.035 | 341.80 | ＜0.0001 | *significant* |
| A-SPS | 1.44×10─3 | 1 | 1.44×10─3 | 14.19 | 0.0055 |  |
| B-Fe2+ | 0.14 | 1 | 0.14 | 1427.21 | ＜0.0001 |  |
| C-PG | 0.019 | 1 | 0.019 | 190.10 | ＜0.0001 |  |
| AB | 4.02×10─7 | 1 | 4.02×10─7 | 3.97×10─3 | 0.9513 |  |
| AC | 3.92×10─8 | 1 | 3.92×10─8 | 3.88×10─4 | 0.9848 |  |
| BC | 1.88×10─3 | 1 | 1.88×10─3 | 18.53 | 0.0026 |  |
| A2 | 1.45×10─3 | 1 | 1.45×10─3 | 14.31 | 0.0054 |  |
| B2 | 0.059 | 1 | 0.059 | 580.35 | ＜0.0001 |  |
| C2 | 4.90×10─3 | 1 | 4.90×10─3 | 48.38 | 0.0001 |  |
| Residual | 8.10×10─4 | 8 | 1.01×10─4 |  |  |  |
| Lack of Fit | 6.10×10─4 | 5 | 1.22×10─4 | 1.83 | 0.3283 | *not significant* |
| Pure Error | 2.00×10─5 | 3 | 6.66×10─5 |  |  |  |
| Cor Total | 0.31 | 17 |  |  |  |  |