SUPPLEMENTARY DATA

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DEREVERATION OF THE INTERGRATED RATE EQUATION

With a rate equation of the form:

\[
\frac{dC}{dt} = -kCA
\]

Where the rate constant k is a function of pH and has the units m\(^2\) s\(^{-1}\). If the reactive surface area is lost due to the surface reaction of Cr (VI) with Fe (O), the surface area can be described by an equation such as:

\[
A = A_0 - (C_0 - C)V/B
\]

Where \(A_0\) is the initial reactive surface area (m\(^2\)), B is the specific capacity of the iron surface to reduce Cr (VI) (mM.m\(^2\)), and V is the volume of liquid in contact with the iron. Therefore:

\[
\frac{dC}{dt} = -k \frac{C_0V}{B} C \left( \frac{A_0B}{C_0V} - 1 + \frac{C}{C_0} \right)
\]

Defining the capacity ratio for the system as \(r = A_0B/C_0V\)

\[
\frac{dC}{dt} = -k \frac{A_0}{r} C \left( r - 1 + \frac{C}{C_0} \right)
\]

Using substitutions \(D = (r-1)C_0\) and \(E = kA_0/(r.C_0)\) the equation simplifies to:

\[
\frac{dC}{dt} = -E C (D + C)
\]

Which, after variable separation can be integrated by use of partial fractions, provided \(D \neq 0\):

\[
\int \frac{dC}{C} - \int \frac{dC}{(D + C)} = -E D \int dt
\]
Integration yields:

\[ \ln C - \ln(D + C) = -EDt + \text{constant} \]

When \( t=0 \), \( C=C_0 \):

\[ \frac{C}{D + C} = \frac{C_0}{D + C_0} e^{-EDt} \]

Rearranging for \( C \):

\[ C = \frac{D \left( \frac{C_0}{D + C_0} \right) e^{-EDt}}{1 - \left( \frac{C_0}{D + C_0} \right) e^{-EDt}} \]

Substituting for \( D \):

\[ \frac{C}{C_0} = \frac{(r-1)e^{-EDt}}{r - e^{-EDt}} \]

Where \( ED = kA_0(r-1)/r \):

\[ \frac{C}{C_0} = \frac{(r-1)e^{-kA_0(t-1)/r}}{r - e^{-kA_0(t-1)/r}}t \]
Figure S1: [Cr(VI)] vs. time for (A) 1mmol.L$^{-1}$ chromate solution pH 12.0 ± 0.1 and (B) 1mmol.L$^{-1}$ COPR leachate pH 11.9 ± 0.2.
Figure S2: [Cr(VI)] vs. time for tests with 100 g.L$^{-1}$ ZVI in COPR leachate containing 1mmol.L$^{-1}$ of Cr(VI) where the initial pH has been buffered to different values.