SUPPLEMENTARY DATA

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DEREVATION 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:

$$Ln\ C - Ln(D + C) = -EDt + constant$$

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:

$$\frac{C}{C_0} = \frac{(r-1)e^{-kA_0\left(\frac{r-1}{r}\right)t}}{r - e^{-kA_0\left(\frac{r-1}{r}\right)t}}$$

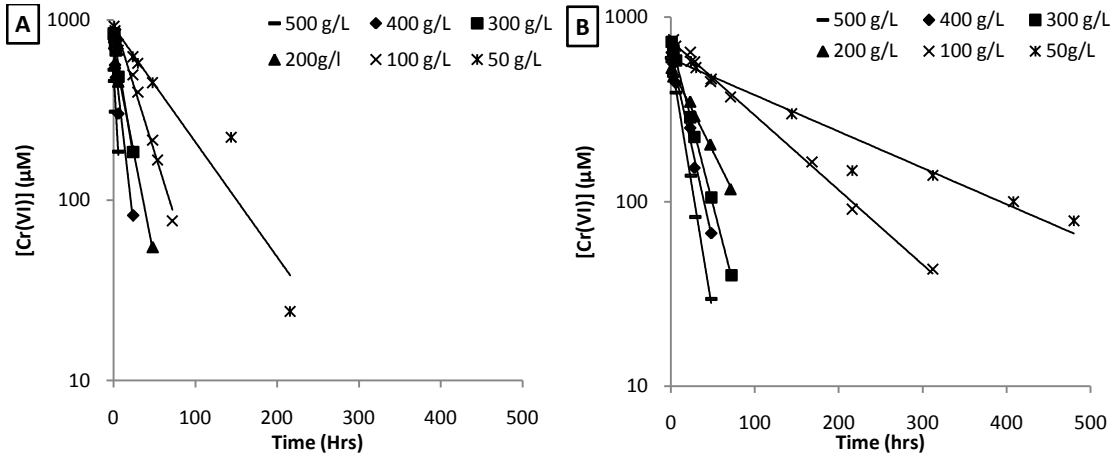

Figure S1: [Cr(VI)] vs. time for (A) 1mmol.L^{-1} chromate solution pH 12.0 ±0.1 and (B) 1mmol.L^{-1} COPR leachate pH 11.9 ± 0.2.

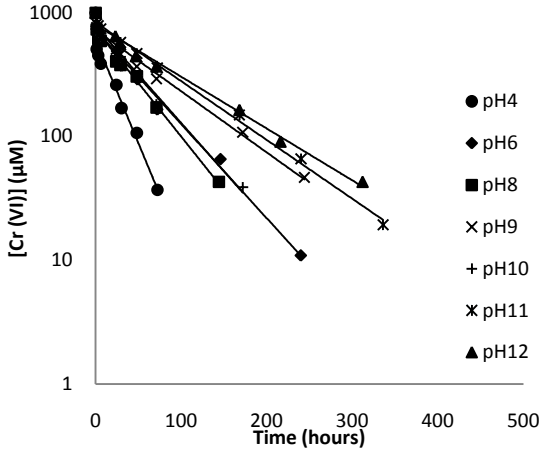

Figure S2: [Cr(VI)] vs. time for tests with 100 $g.L^{-1}$ ZVI in COPR leachate containing 1$mmol.L^{-1}$ of Cr(VI) where the initial pH has been buffered to different values.