Supporting Information

Low doses of electron beam irradiation effectively degrade 1,4-dioxane in water within a few seconds

Cheng-Shiuan Lee[1,2], Kaushik Londhe[1,3], Slavica Grdanovska[4], Charlie A. Cooper[4], and Arjun K. Venkatesan [1,3,5,†]

[1] New York State Center for Clean Water Technology, Stony Brook University, Stony Brook, New York 11794, United States

[2] Research Center for Environmental Changes, Academia Sinica, Taipei 115, Taiwan

[3] Department of Civil Engineering, Stony Brook University, Stony Brook, New York 11794, United States

[4] Fermi National Accelerator Laboratory, Batavia, Illinois 60510, United States

[5] School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, New York 11794, United States

[†] Corresponding author; Phone: +1 631-632-1998; Email: arjun.venkatesan@stonybrook.edu

Table S1. Characterization of groundwater matrix

Water Quality parameter	Groundwater
Conductivity (μS/cm)	208
ORP (mV)	173
Alkalinity (mg/L as $CaCO_3$)	430
Chloride (mg/L)	21.6
Sulfate (mg/L)	1.18
Total Organic Carbon (mg C/L)	5.10
Ammonia (mg N/L)	1.29
TKN (mg N/L)	1.70
Nitrate + Nitrite (mg N/L)	0.01
Nitrite (mg N/L)	0.01
Orthophosphate (mg P/L)	BDL

Table S2. Instrument conditions of GC/MS, HPLC, and IC

(a) GC/MS

Inlet
Injection volumn: 1 μL, Splitless injection
Inlet temp: 200 °C

Column
J&W CP-Select 624 CB
(30 m x 0.25 mm, 1.4 μm film thickness)
Column Flow Rate: 1mL/min (Helium)

Oven temperature program
1. 30 °C (hold for 1 min)
2. 90 °C (ramp at 7 °C/min)
3. 200 °C (ramp at 20 °C/min, hold for 3 min)
Total run time: 18 min

MS condition
MS transfer line temp: 150 °C
MS source temp: 150 °C
MS quad temp: 150 °C

Scan mode-SIM
THF-*d8* : m/z 46,78, and 80 (6 to 8 min)
1,4-Dioxane: m/z 58, 88 (8 to 18 min)
1,4-Dioxane-*d8* : m/z 62, 64, 96 (8 to 18 min)

(b) HPLC

Injection volumn: 50 μL
Column: Agilent ZOBRAX RP C18
(250 mm x 4.6 mm, 5 μm)
Flow rate: 1 mL/min
Eluent: CH_3CN:H_2O (70:30, v/v)
Detection: 210 nm
Total run time: 15 min

(c) IC

Injection volumn: 250 μL
Column: Metrohm A Supp anion column
(100 mm x 7.8 mm, 9 μm)
Flow rate: 0.7 mL/min
Eluent: $NaHCO_3$ (1.0 mM) + $NaCO_3$ (3.2 mM)
Detection: Conductivity
Total run time: 20 min

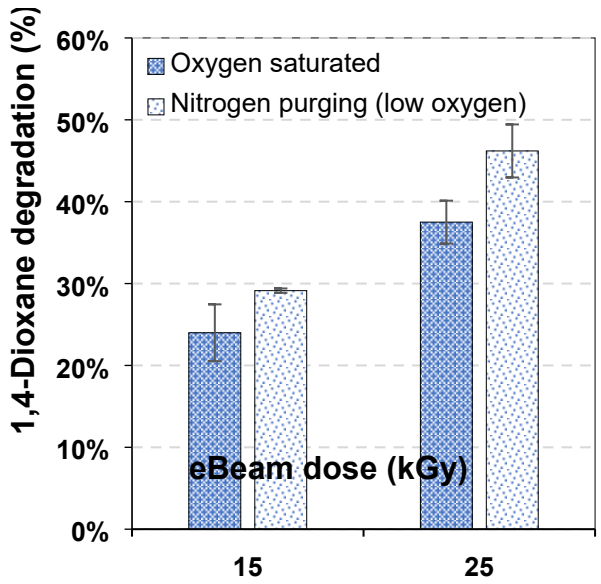

Figure S1. Effect of dissolved oxygen levels on 1,4-dioxane degradation. Initial 1,4-dioxane concentration: 1000 mg/L in MQW