It is a systematical study on kinetic analysis of the environmentally friendly leaching of spent lithium-ion batteries using monocarboxylic acid

Some comments are:

1. Error bars are missing.

2. In the end of the discussion section, some recommendations should be provided to further improve the Cu recovery (from 96% to ~100%), such as microwave reduction leaching [1], ultrasound-assisted leaching [2], and closed-vessel microwave leaching [3]

[1] Fu, Y.; He, Y.; Yang, Y.; Qu, L.; Li, J.; Zhou, R. Microwave Reduction Enhanced Leaching of Valuable Metals from Spent Lithium-Ion Batteries. J. Alloys Compd. 2020, 832, 154920.

[2] Bu, X.; Danstan, J.K.; Hassanzadeh, A.; Behrad Vakylabad, A.; Chelgani, S.C. Metal Extraction from Ores and Waste Materials by Ultrasound-Assisted Leaching -an Overview. Miner. Process. Extr. Metall. Rev. 2022, 1–18.

[3] Lie, J.; Liu, J.-C. Closed-Vessel Microwave Leaching of Valuable Metals from Spent Lithium-Ion Batteries (LIBs) Using Dual-Function Leaching Agent: Ascorbic Acid. Sep. Purif. Technol. 2021, 266, 118458.

3. It is suggested that the authors should compare the fitting performance of Zhuravlev's Model with other leaching kinetic modes.

Table 4
Leaching kinetic models.

Name		No.	Equation
Volumetric reaction model	Diffusion control	1	$-\ln(1-\alpha) = kt$
	Chemical reaction control	2	$\frac{1}{1-\alpha}-1 = kt$
Unreacted shrinkage core model	Diffusion control	3	$1-3(1-\alpha)^{2/3} + 2(1-\alpha) = kt$
	Chemical reaction control	4	$1-(1-\alpha)^{1/3} = kt$

Collected from ref. "Effect of ultrasound power on HCl leaching kinetics of impurity removal of aphanitic graphite Ultrasonics Sonochemistry 95 (2023) 1064"

Table 1 Rate equations for different kinetic models

Rate equation	Model	References
Shrinking Core Model–cylindrical particles		
$1-(1-X_s)^{1/2}=kt$	Chemical reaction control	[30]
$X_s+(1-X_s)\ln(1-X_s)=kt$	Ash diffusion control	[30]
$X_s=kt$	Film diffusion control	[30]
Alternative Kinetic Models		
$[-\ln(1-X_s)]^{1/n}=kt$	Avrami Kinetic Model	[36]
$X_s=kt$	Zero order	[36]
$-\ln(1-X_s)=kt$	Pseudo-homogeneous first order	[36]
$(1-X_s)^{-1}=kt$	Pseudo-homogeneous second order	[36]
$X_s^{1/2}=kt$	Power law (half)	[36]
$X_s^{1/3}=kt$	Power law (third)	[36]
$X_s^{1/4}=kt$	Power law (quarter)	[36]
$\ln X_s=kt$	Exponential	[36]
$\exp[-(1-X_s)]-\exp(-1)=kt$	Exponential	[36]
$\ln[X_s/(1-X_s)]=kt$	Prout–Tompkins	[36]

Collected from ref. “Leaching Kinetics of Mo, Ni, and Al Oxides from Spent Nickel–Molybdenum Hydrodesulfurization Catalyst in H2SO4 Solution, Journal of Sustainable Metallurgy (2021) 7:470–480”