Titre: Title:	Comparison of organic materials for the passive treatment of synthetic neutral mine drainage contaminated by nickel: Adsorption and desorption kinetics and isotherms
Auteurs: Authors:	Dominique Richard, Alfonso Mucci, Carmen Mihaela Neculita, & Gérald J. Zagury
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Article Title: Comparison of organic materials for the passive treatment of synthetic neutral drainage contaminated by nickel: Adsorption and desorption kinetics and isotherms

Authors: Dominique Richard[1], Alfonso Mucci[2], Carmen-Mihaela Neculita[3], Gérald J. Zagury[1*]

[1] Research Institute on Mines and Environment (RIME), Polytechnique Montréal, QC, Canada, H3C 3A7

[2] GEOTOP and Department of Earth and Planetary Sciences, McGill University, 3450 University Street Montreal, Québec, Canada, H3A 2A7

[3] RIME, University of Quebec in Abitibi-Temiscamingue (UQAT), 445 Boul. de l'Université, Rouyn-Noranda, QC, J9X 5E4, Canada

*corresponding author
Email: gerald.zagury@polymtl.ca, Tel: +1 514 320 4711 ext: 4980, Fax: +1 514 340-4477

Determination of wet: dry weight ratio for desorption kinetic experiments (Materials and methods)

Before the desorption kinetic experiment, the wet solid remaining in the 50 ml centrifuge tube at the end of the adsorption experiment was transferred to an empty 500 mL Erlenmeyer flask and its wet weight was determined by weighing the tube before and after this transfer. The wet solid was then used directly for the desorption experiment and the weight of the dry solid was never measured directly. In order to estimate the dry weight of the solid in desorption experiments, a pre-determined wet: dry weight ratio was used.

To determine this ratio, a distinct and identical experimental procedure simulating the adsorption kinetic experiment was conducted with all substrates in triplicate 500 mL Erlenmeyer flasks. The wet solids obtained at the end of the simulated adsorption phase were transferred from the 50 ml centrifuge tube in to 125 mL pre-weighted Erlenmeyer flasks and the water contents were determined by drying at temperatures of 60-110°C, until constant weight was obtained. During this simulated experiment, triplicate wet weight and corresponding dry weight values were measured for each substrate and the mean wet: dry weight ratio was used to determine the dry weight of the solid in the 500 mL Erlenmeyer flasks during the real desorption experiment.

Determination of wet: dry weight ratio for desorption equilibration experiments (Materials and methods)

Before the desorption equilibration experiment, the wet solid remaining in the 50 ml centrifuge tube at the end of the adsorption experiment was weighted and used directly in the centrifuge tube for the desorption experiment. The dry weight of the solid in the centrifuge tube was never measured directly and a pre-determined wet: dry weight ratio was used instead to determine its value.

To determine this ratio, a distinct and identical experimental procedure simulating the adsorption equilibration experiment was conducted with all substrates in triplicate 50 ml centrifuge tubes. The water contents of the wet solids obtained at the end of the simulated adsorption phase were determined by drying the wet solid directly in the pre-weighted centrifuge tubes at a temperature of 60 °C for six to seven days. The mean wet: dry weight ratio measured during the simulated experiment was used to determine the dry weight of the solid in the 50 ml centrifuge tube during the real desorption experiment.

Table S1. Langmuir model parameters for nickel adsorption obtained from the literature and measured in this study

Material	Description	pH	q_{max} (mg g^{-1})	K_{ads} (L mg^{-1})	Reference
Brown algae	*Ascophyllum nodosum*, washed (H_2O) and ground (0.105-0.295 mm)	3.5	70	1.26	Leusch et al. (1997)
Brown algae	*Ascophyllum nodosum*, washed (H_2O) and ground	6	136	0.56	Holan and Volesky (1994)
Brown algae	*Ascophyllum nodosum*, washed (H_2O) and ground (< 0.5 mm)	6	43.3	0.13	Romera et al. (2007)
Brown algae	*Ascophyllum nodosum*, crushed (< 5 mm) and washed (0.1 mol L^{-1} HCL)	6.6-7.2	6.9	0.04	This study
Sawdust	Walnut sawdust, washed (H_2O) and ground	unadjusted	3.29	0.01	Bulut and Tez (2007)
Sawdust	Maple sawdust, untreated	unadjusted	0.27	0.69	Calculated from the work of Shukla et al. (2005)
Sawdust	Maple sawdust, untreated	6.3-7.1	3.8	0.03	This study
Wood ash	80% coniferous and 20% hardwood chips pyrolised (450°C), crushed (< 2mm)	7.4	0.46	0.14	Calculated from the work of Rees et al. (2014)
Wood ash	Pyrolised wood from Kirkland Lake biorefinery	7-7.1	3.9	0.04	This study
Compost	Pine bark compost, ground (<2mm)	unadjusted	0.7	0.021	Gichangi et al. (2012)
Compost	Olive tree pruning compost	5	10.53	0.015	Anastopoulos et al. (2013)
Compost	Municipal green waste compost (<5mm)	6.7-7	8.8	0.13	This study
Peat	Commercial sphagnum peat moss from Great Britain (<1.18mm)	7	9.18	4.85	Ho et al. (1995)
Peat	Sphagnum peat moss from New Zealand (0.5-0.71 mm)	4.5	9.7	1×10^{-4}	Calculated from the work of Ho et al. (2002)
Peat	Mechanically excavated and refined peat from Poland (<0.4mm)	5	61.27	0.015	Bartczak et al. (2018)
Peat	Commercial sphagnum peat moss from Canada (<5mm)	6.3-7.4	22	0.15	This study

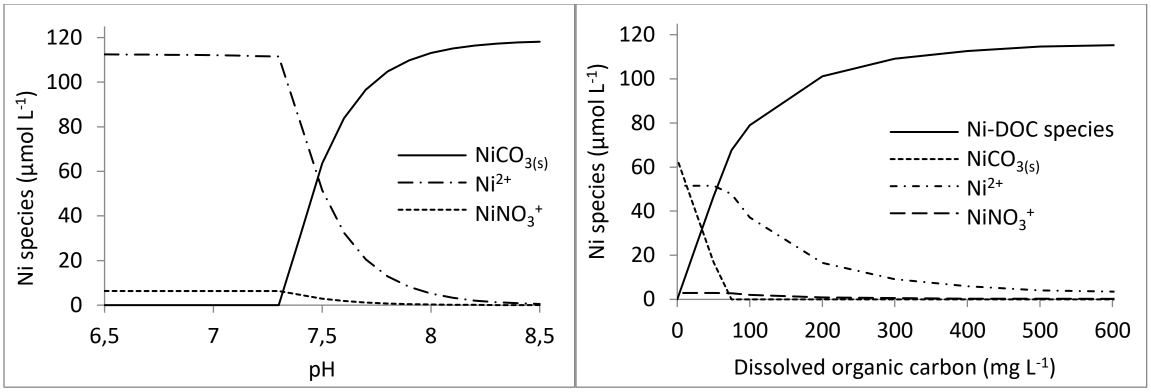

Figure S1. Model results for an open (pCO_2 = 385 ppm) 0.05M $NaNO_3$ system with $[Ni]_{tot}$ = 7.0 mg L^{-1} or 119 µmol L^{-1}. Species with concentrations below 1 µmol L^{-1} are not presented. (A) Nickel speciation as a function of pH, in the absence of DOC. (B) Nickel speciation as a function of DOC concentration at pH=7.5.

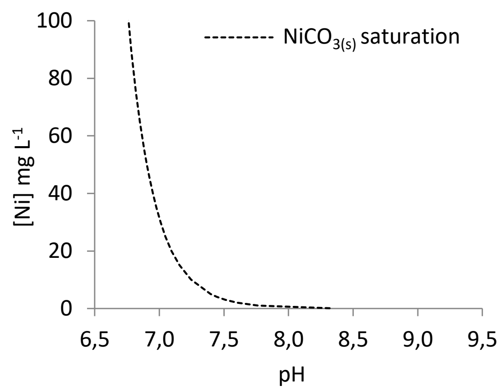

Figure S2. Saturation with respect to $NiCO_{3(s)}$ as a function of pH in an open (pCO_2 = 385 ppm) 0.05M $NaNO_3$ system, in the absence of DOC.

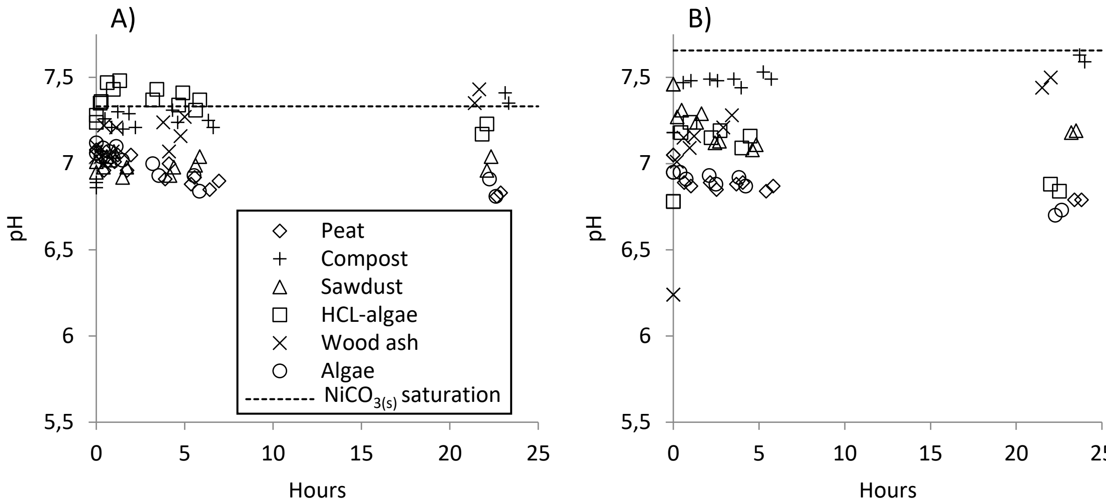

Figure S3 Temporal evolution of pH during the kinetic adsorption (A) and desorption (B) experiments.

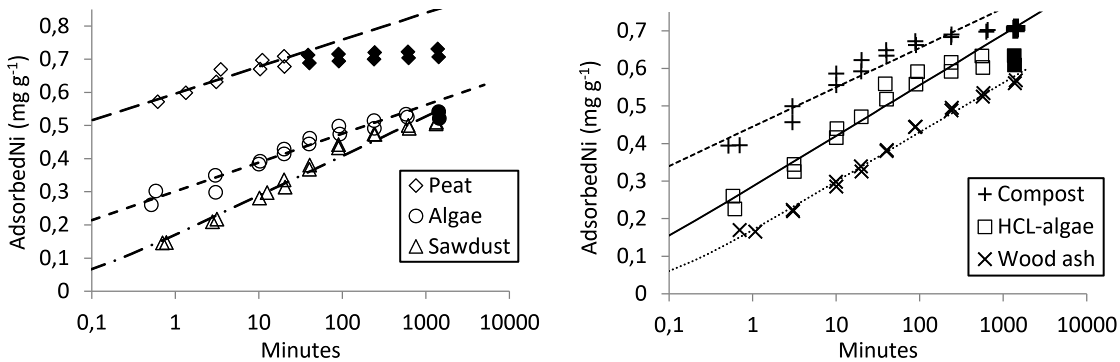

Figure S4. Adsorbed nickel concentrations as a function of time and Elovich model fits. Empty symbols identify data used for model fitting.

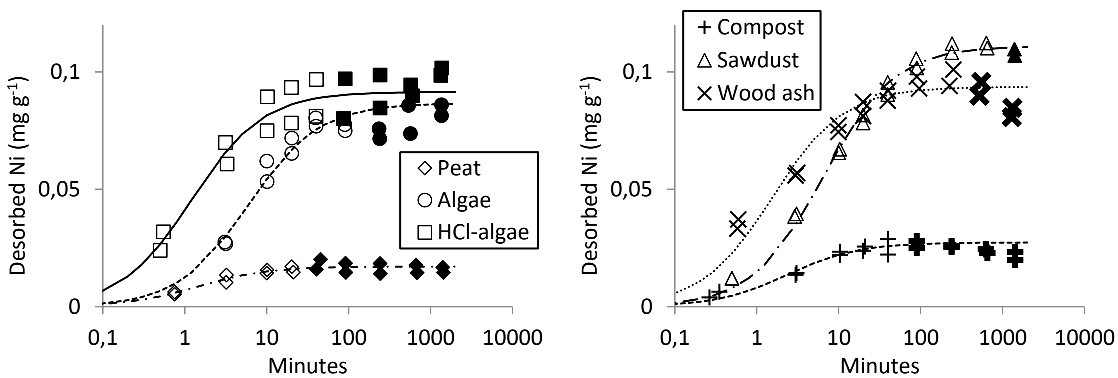

Figure S5. Desorbed nickel concentrations during desorption experiment with pseudo-second order model fit. Empty symbols identify data used for model fitting

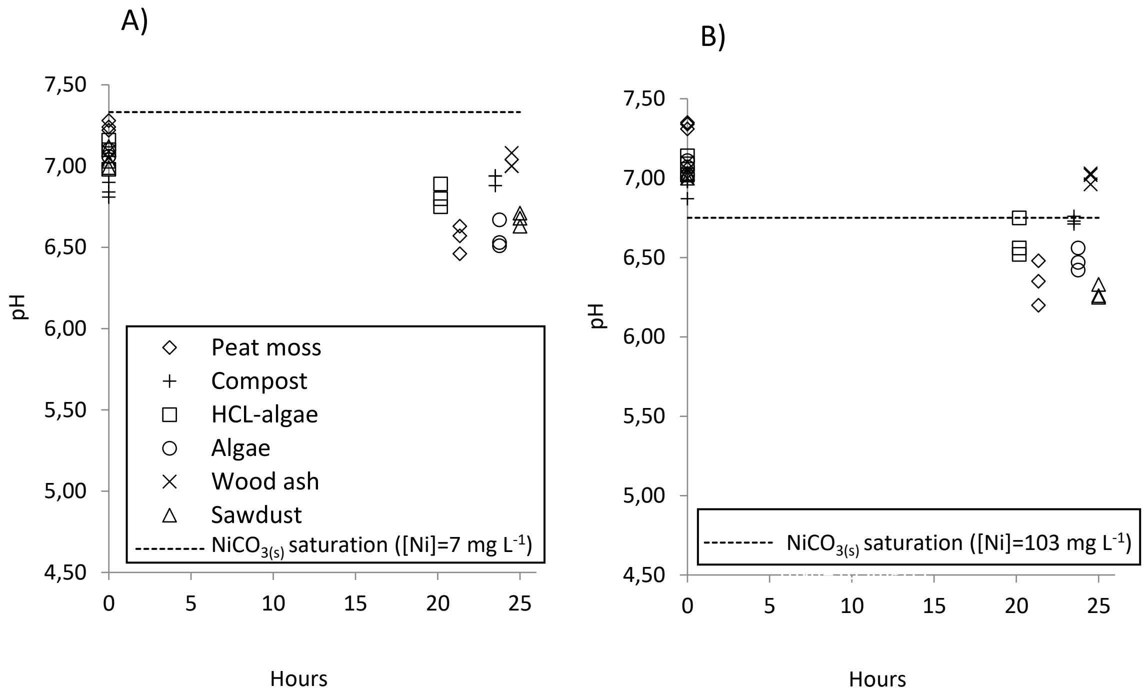

Figure S6 Initial and final pH values during adsorption equilibration experiment, for (A) samples with initial [Ni] = 7 mg L^{-1} (119 µmol L^{-1}) and (B) samples with initial [Ni] =103mg L^{-1} (1750 µmol L^{-1}).

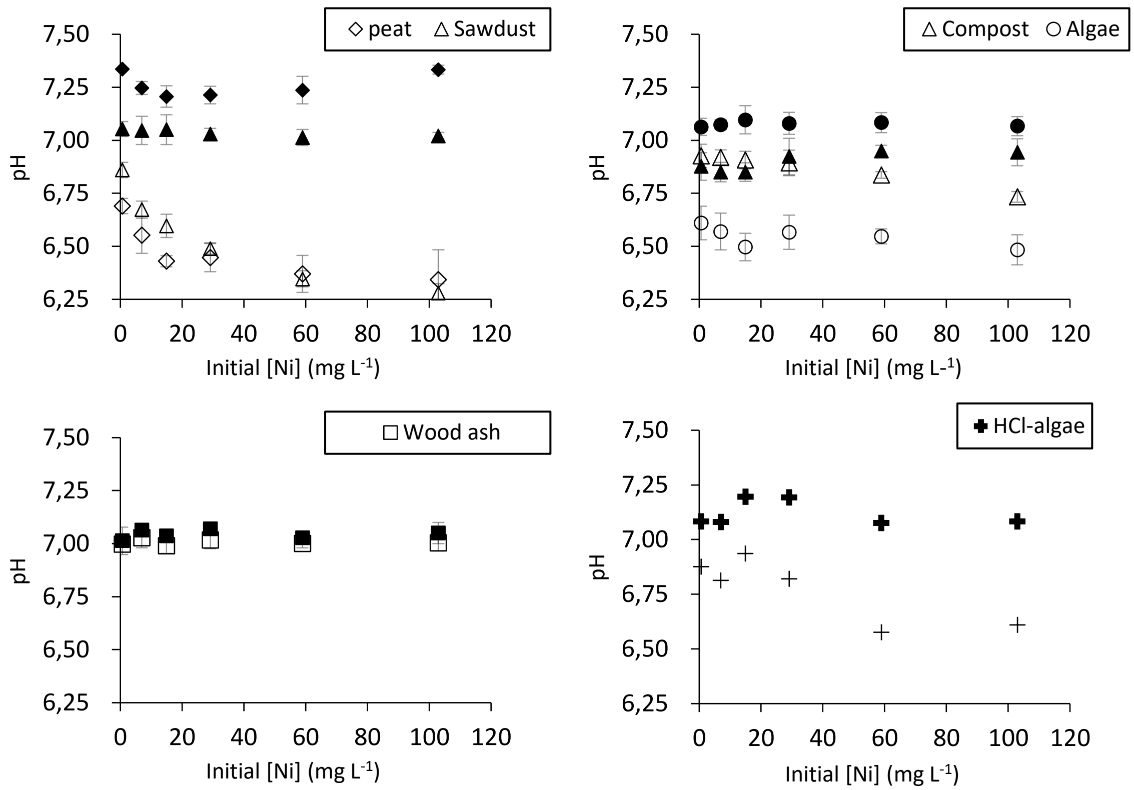

Figure S7. Initial (full symbols) and final (empty symbols) pH during adsorption equilibration experiments as a function of initial nickel concentration.

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