Lithium biosorption by *Spirulina platensis* biomass

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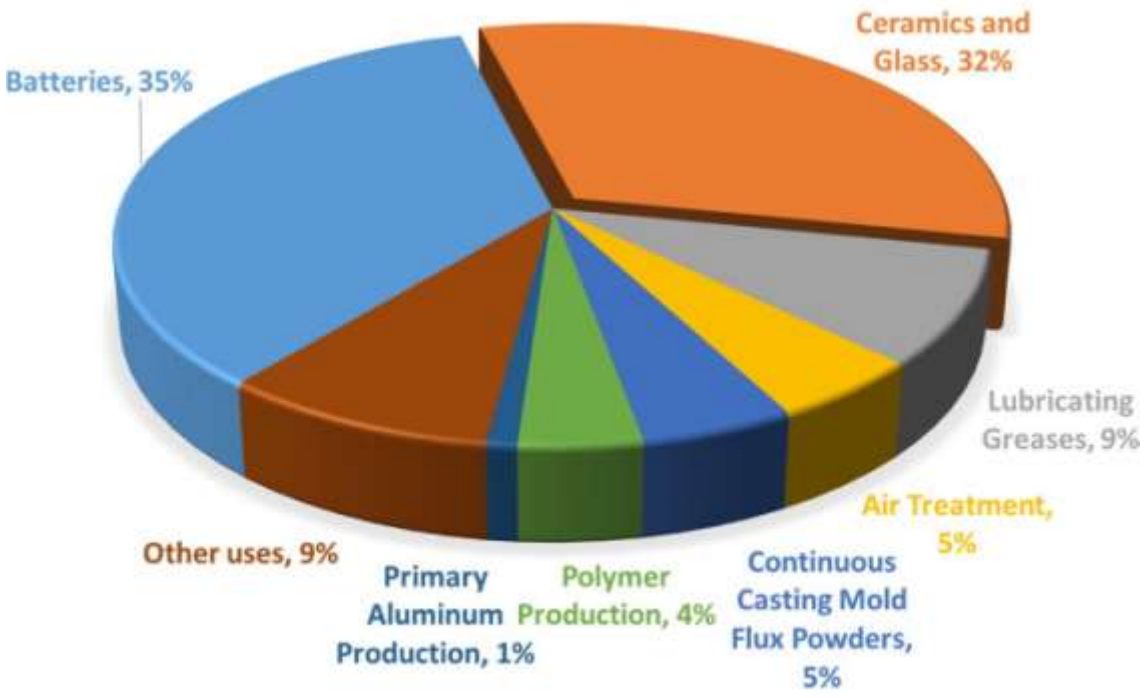
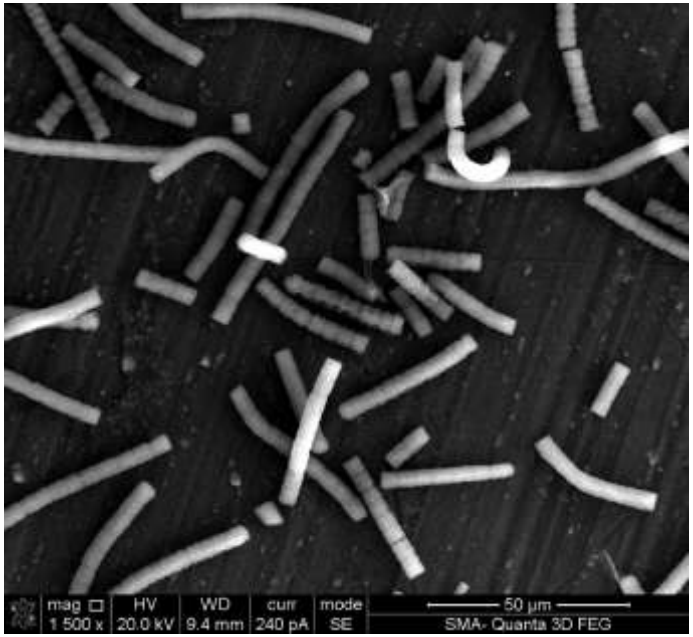
Applications of lithium



Traditional techniques used for lithium removal

- Solvent extraction
- Ion-exchange
- Precipitation
- Membrane processes
- Adsorption

Object of study



Arthrospira (Spirulina) platensis is a filamentous plankton cyanobacteria (gram-negative), or a multicellular helical filamentous alga. biomass purchased from "Biosolar MSU" company was dried in an oven at 80°C for 24 h. Then the biomass was homogenized at 600 rpm for 10 min.

The scheme of the experiment

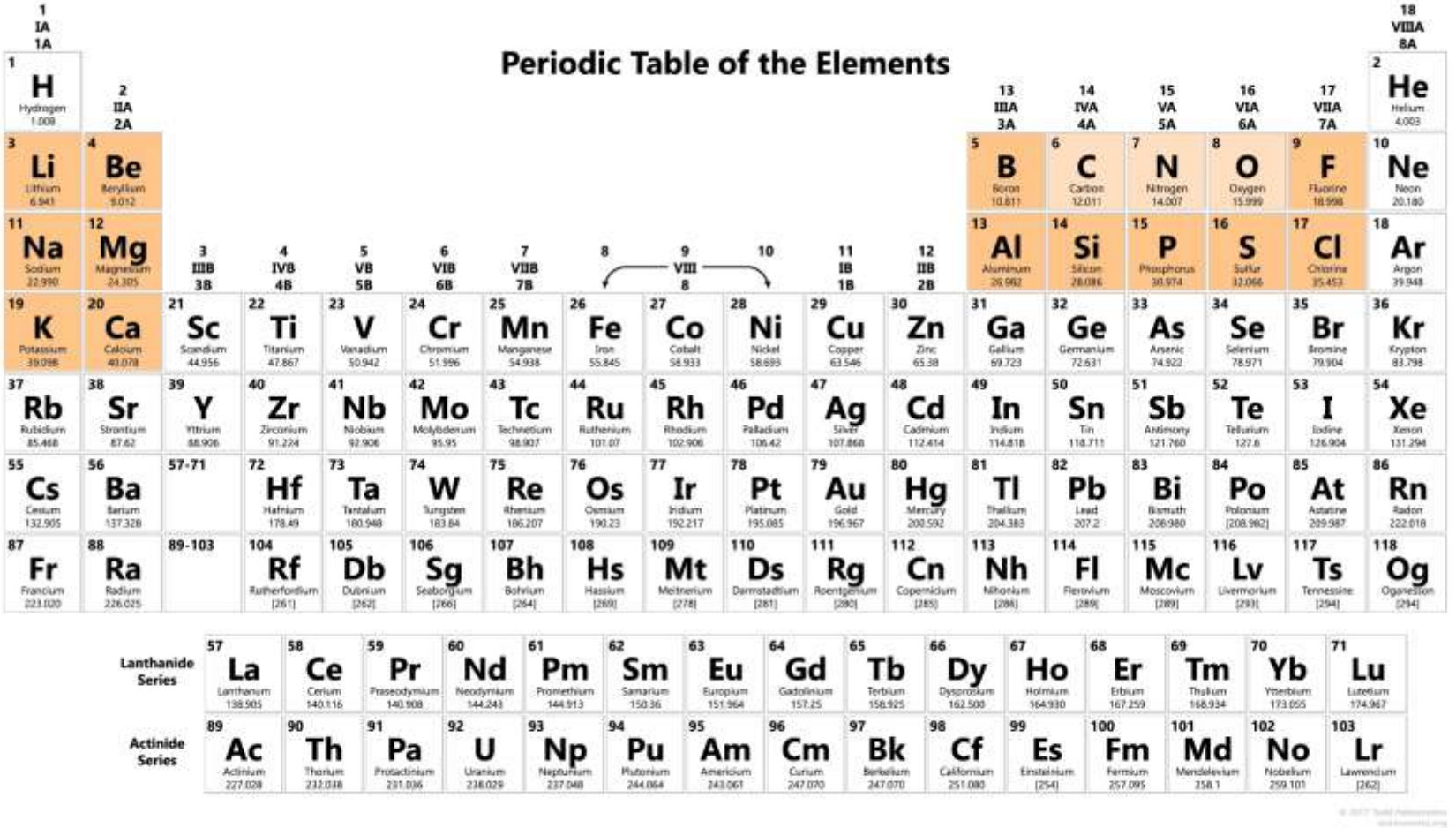
Li_2CO_3   

V = 50 ml
C = 10 mg/L

m = 10 g/L

t= 2 h
v=200 rpm

Proton Induced Gamma Emission (PIGE)

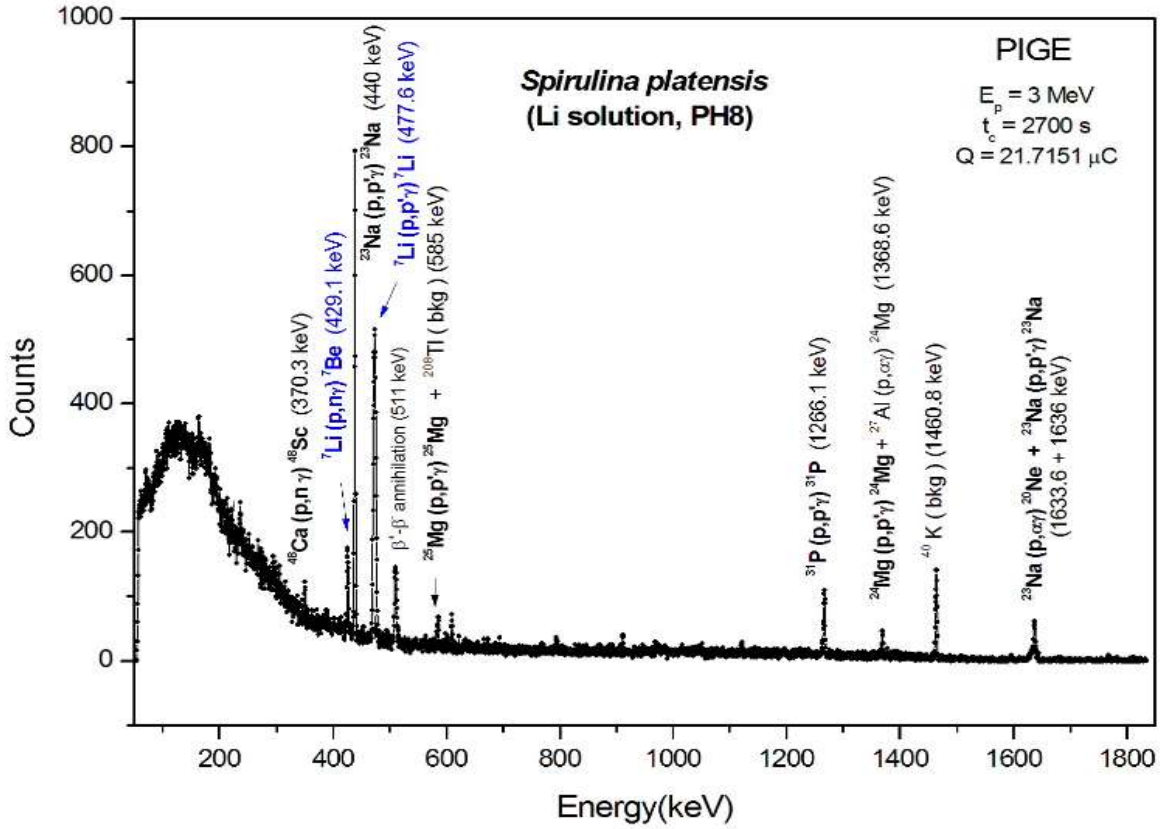


Elements detectable by PIGE method

Proton Induced Gamma Emission (PIGE)

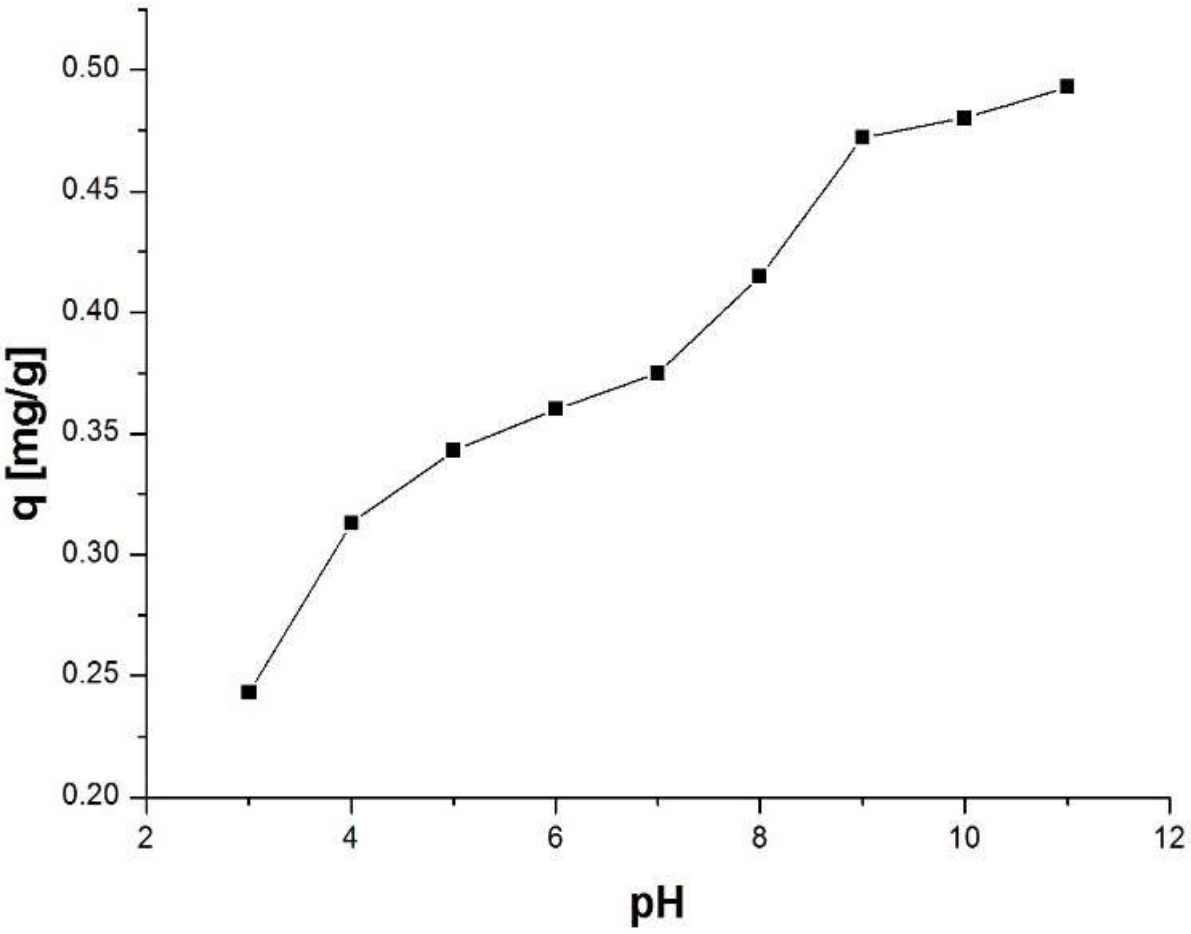
Sample support for proton beam irradiation

Proton Induced Gamma Emission (PIGE)



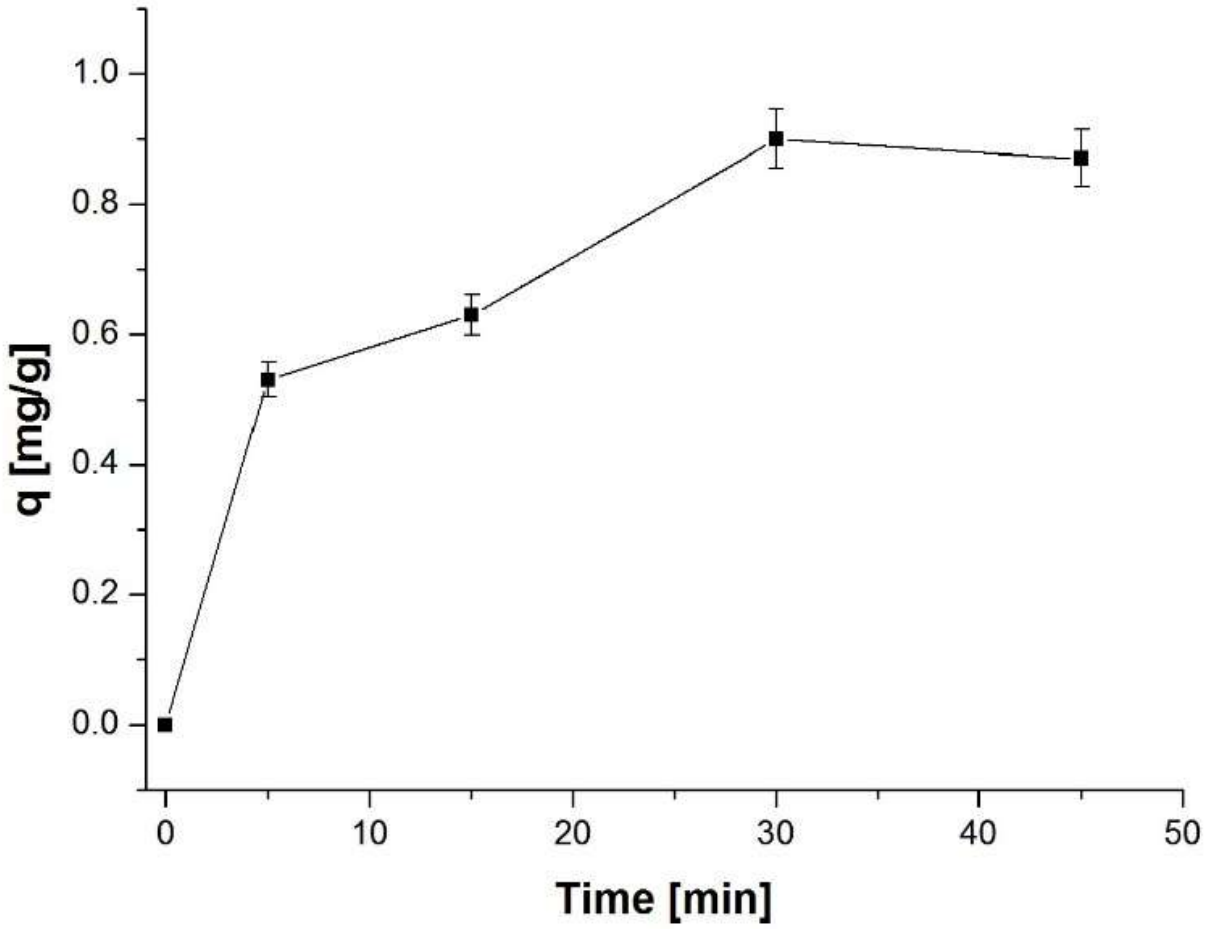
Sample support PIGE spectrum of Li-loaded *Spirulina platensis* biomass

Effect of pH value on biosorption



Experimental conditions: T 20°C; C_i 10 mg/L; sorbent dosage 10 g/L; adsorption time 2 h

Effect of time on biosorption

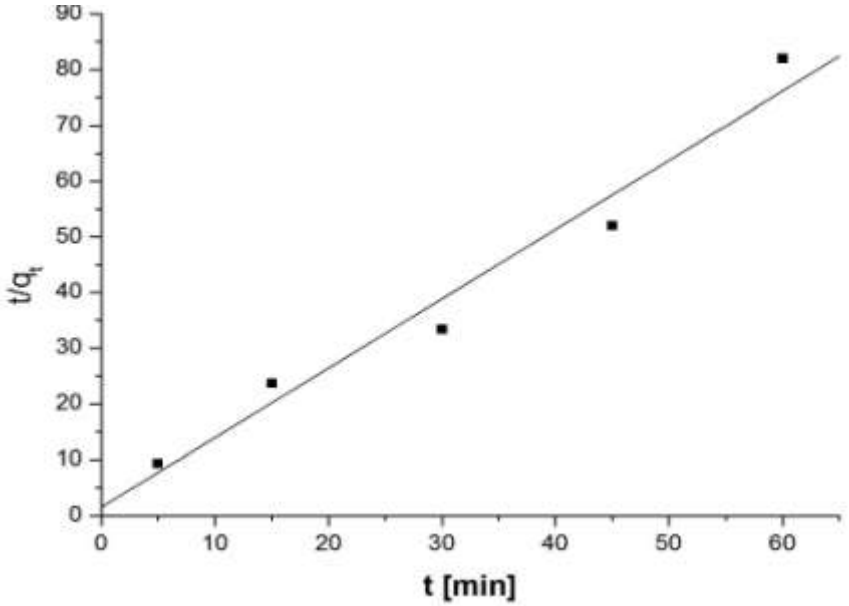


Experimental conditions: T 20°C; C_i 10 mg/L; pH 11; sorbent dosage 10 g/L

Biosorption kinetics

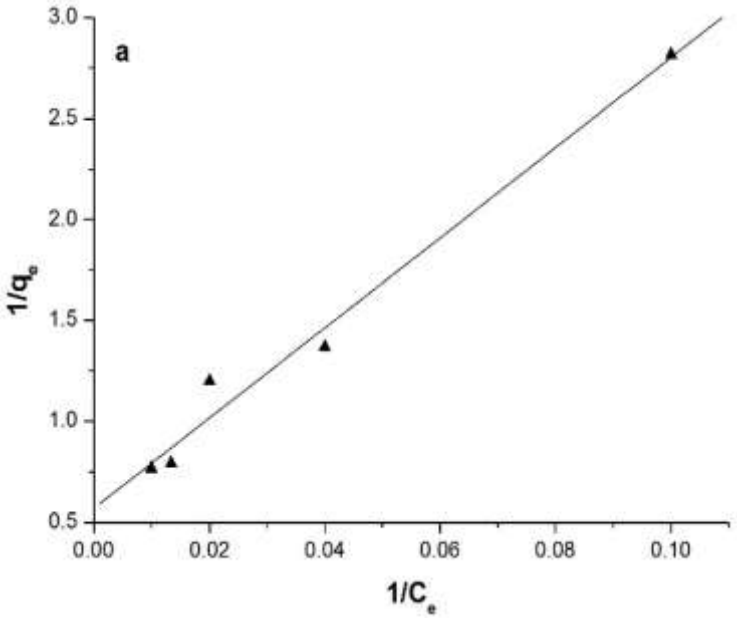
The pseudo-second order model parameters

Pseudo-second-order				
C_e, mg/L	$q_{e\ (exp)}$, mg/g	$q_{e\ (cal)}$, mg/g	K_b, g/mg·min	R^2
10	0.87	0.9	1.97	0,99

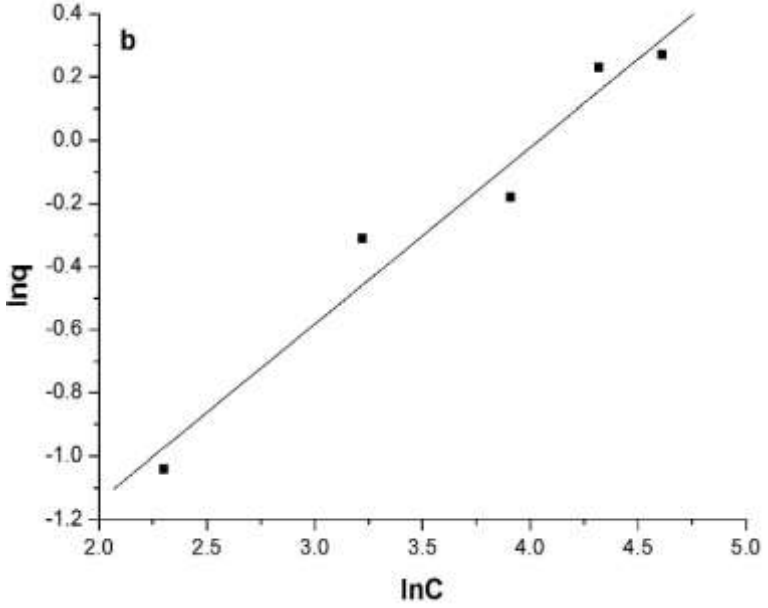


The pseudo-second order plot of kinetic study of lithium biosorption on *A. platensis*

Biosorption equilibrium modeling



Langmuir isotherm model



Freundlich isotherm model

Isotherm parameters for the biosorption of lithium ions on *A. platensis* biomass

Langmuir isotherm		Freundlich isotherm	
R^2	0,99	R^2	0.97
Q_{max}	1.75 mg/g	K	0.1
b	0.015 L/mg	n	1.78

Conclusions

- *A. platensis* biomass can be applied as biosorbent for lithium removal from batch solutions.
- The maximum biosorption capacity of lithium 1.75 mg/g was achieved at pH 11.0 and sorbent dosage 10 g/L.
- Langmuir isotherm model and pseudo-second-order kinetic model described better the biosorption process under consideration.

Thank you for attention!