NEUTRON ACTIVATION ANALYSIS AND RELATED ANALYTICAL TECHNIQUES IN ENVIRONMENTAL AND LIFE SCIENCES

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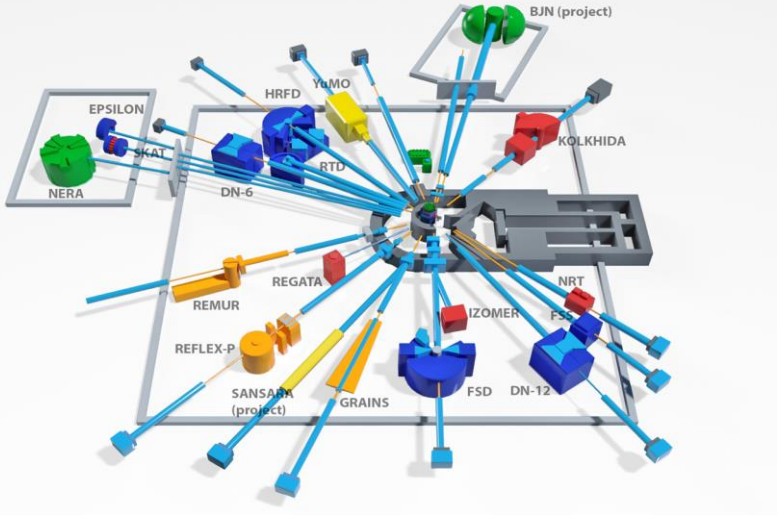
Frank laboratory of neutron physics



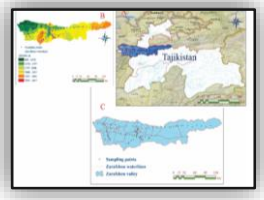
- Major directions of FLNP research program are: neutron-nuclear investigations, condensed matter physics and applied research.

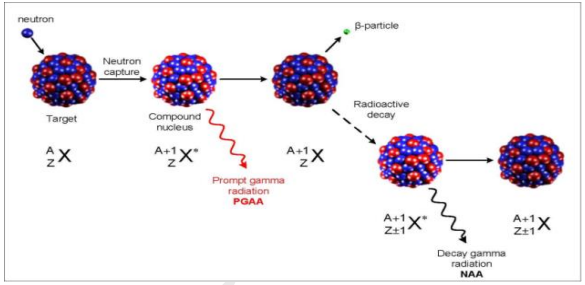
IBR-2 reactor

Neutron activation analysis and its applications

Food products

Geology





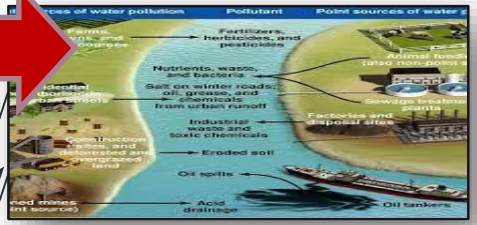
Neutron Activation Analysis (NAA) principle

Biomonitoring

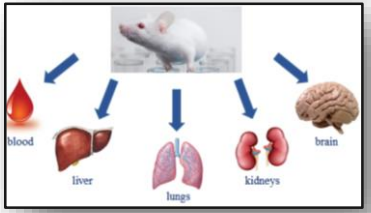
NAA

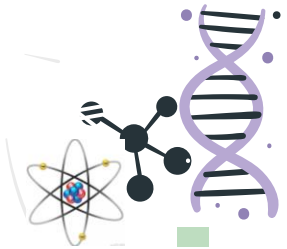
Archeology

Waste water treatment



Nano-toxicity





Active bio-monitoring via Moss

Moss *(Pleurosium Schreberi)* & bags

Cleaning

Weighing

Pelletization

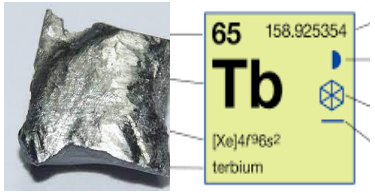
Pells formation

Samples packing

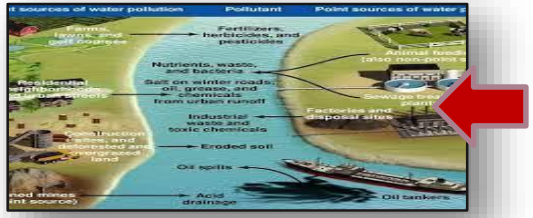
General scheme of sample preparation

Experimental activity

The Plasma Quant 9100
ICP-OES



Terbium Tb



Waste water treatment

Aim of our project

- ❑ Compare the adsorption efficacy of organic and inorganic sorbents for terbium removal

Spirulina platensis
Organic bio sorbent

Indium salt
Inorganic sorbent

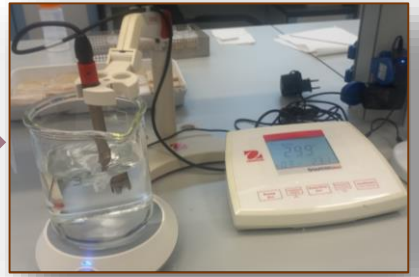
- ❑ Optimization of parameters (time, pH, concentration, temperature) required for maximum adsorption
- ❑ Data analysis using adsorption models

Experimental activity workflow

Weighing

0.02g

preparation of Tb solution



pH measurement

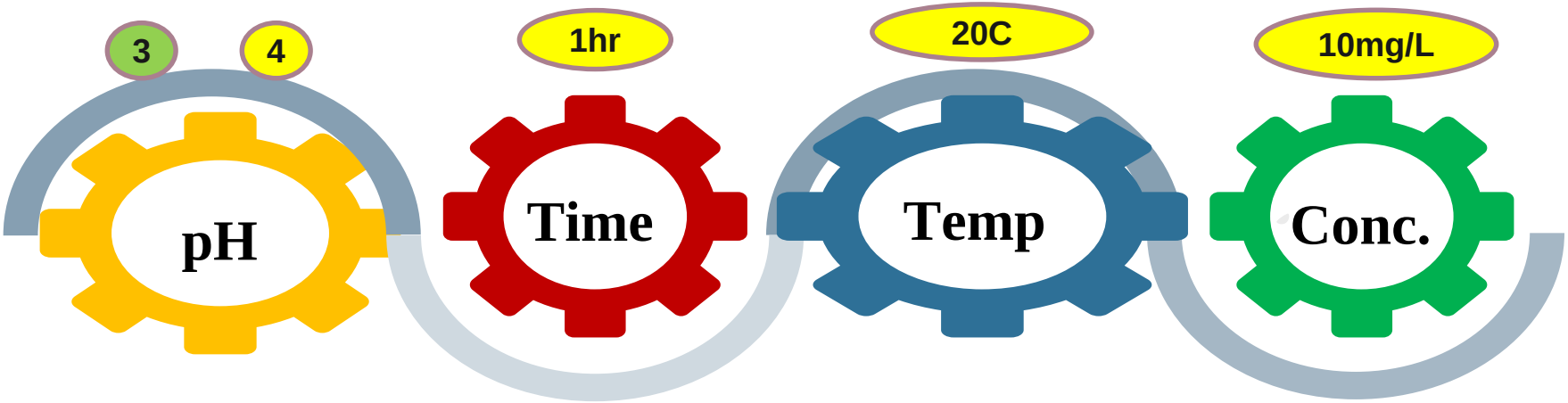
Addition

Incubation

Filtration

ICP

Experimental activity parameters



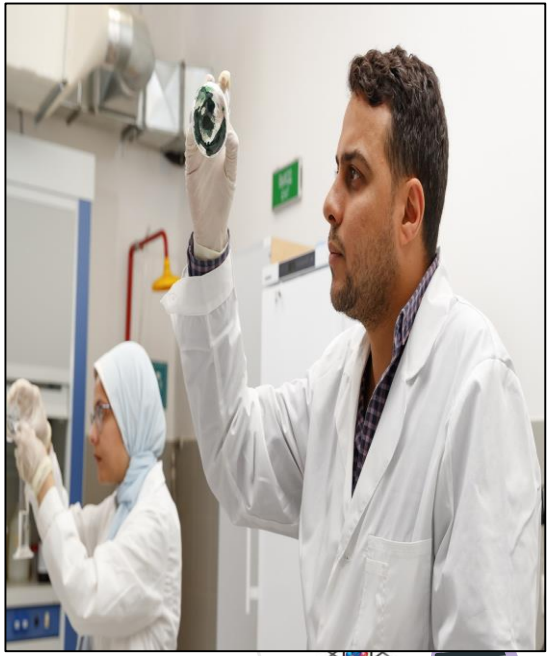
Range: 2-7

Range: 1min-120min

Range: 20°C- 50°C

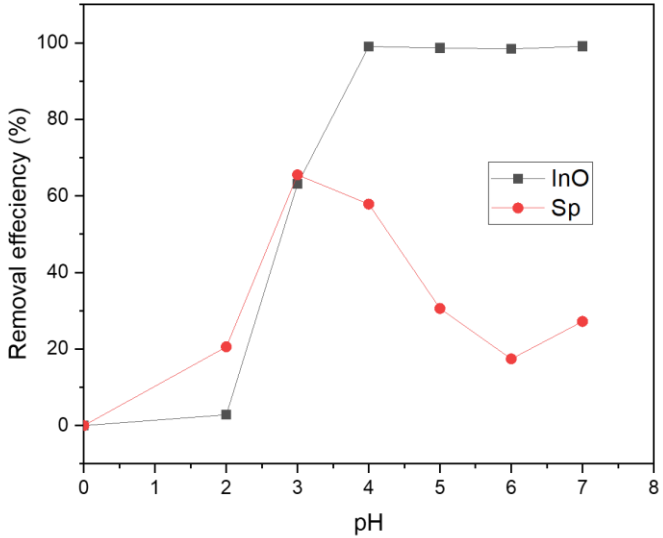
Range: 10mg/L-500mg/L

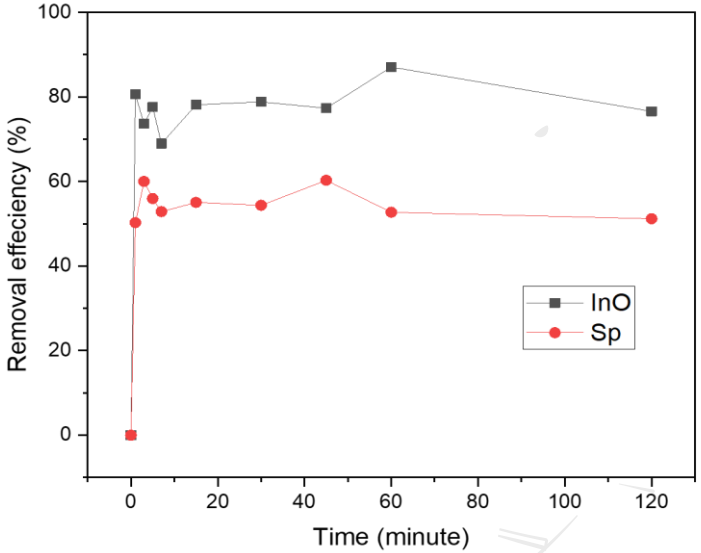
Frank laboratory of neutron physics



Results

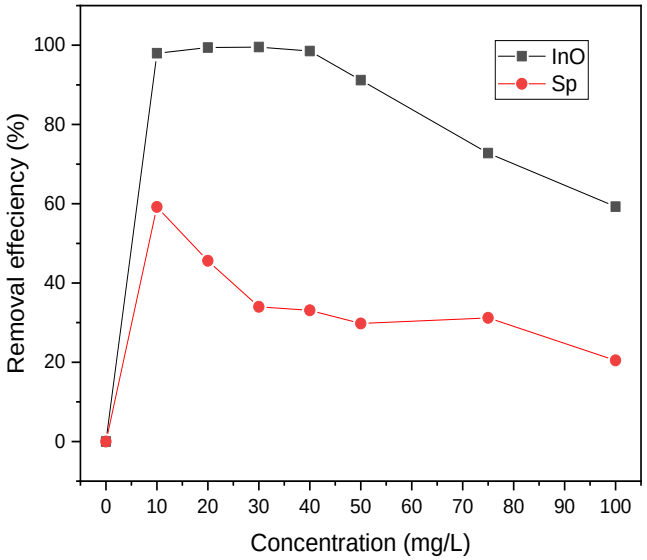
Removal Parameters !

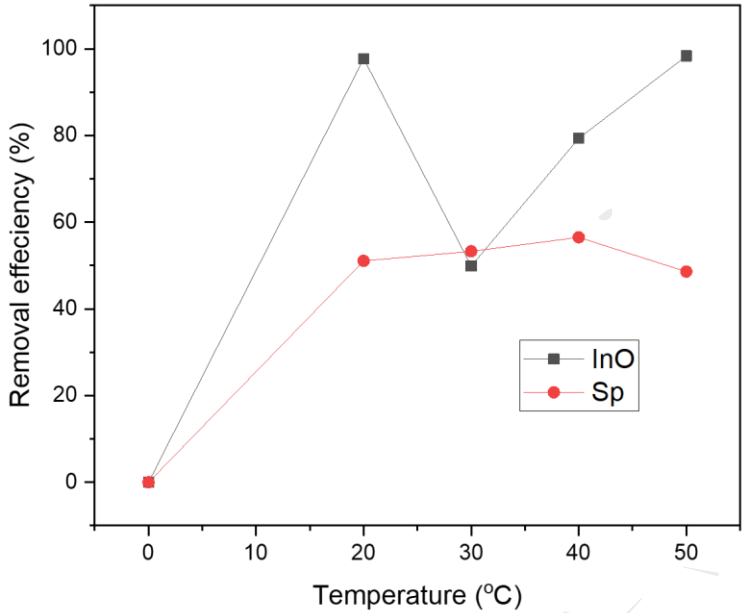




Effect of pH and Adsorption Time on Terbium removal

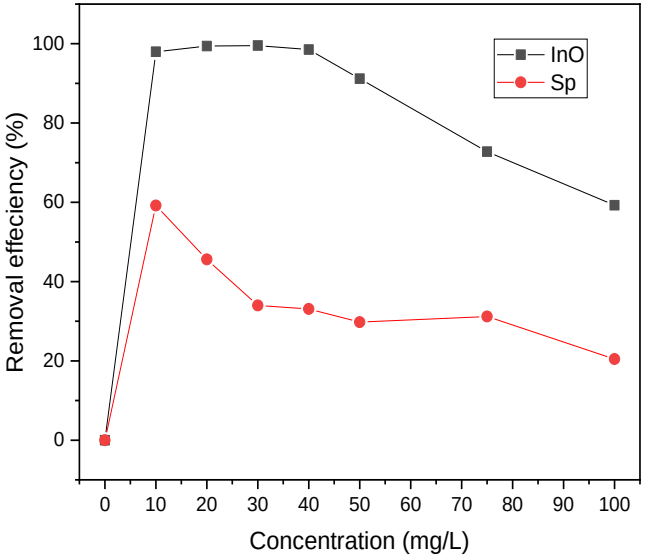
Results

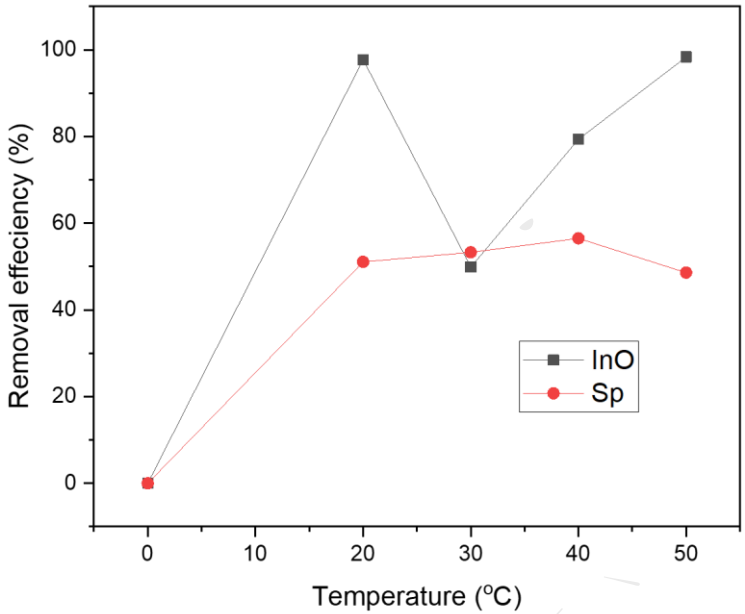




Effect of Concentration and Temperature on Terbium removal

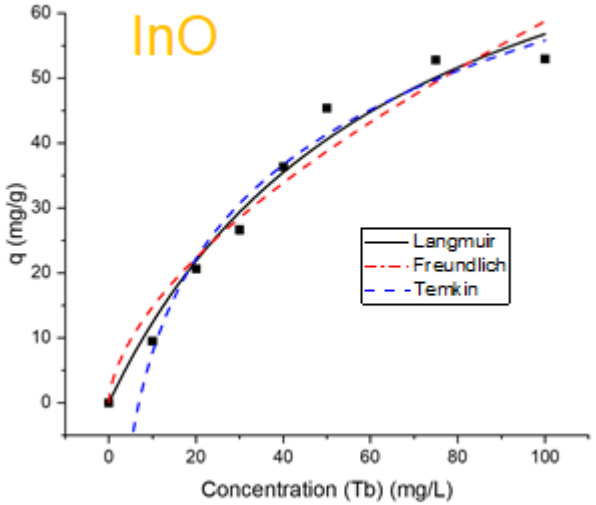
Results

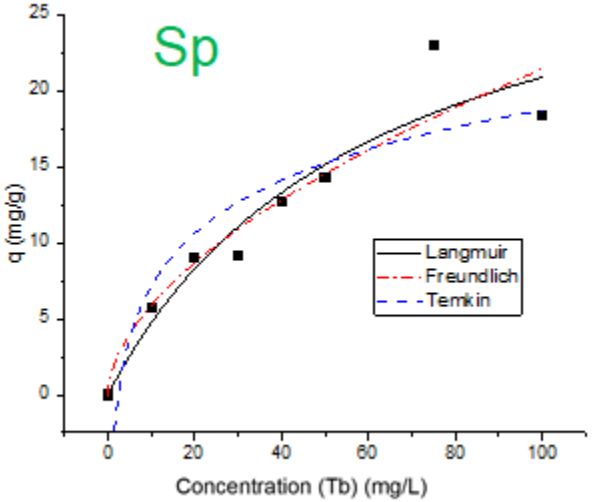




Effect of Concentration and Temperature on Terbium removal

Isotherms Study !

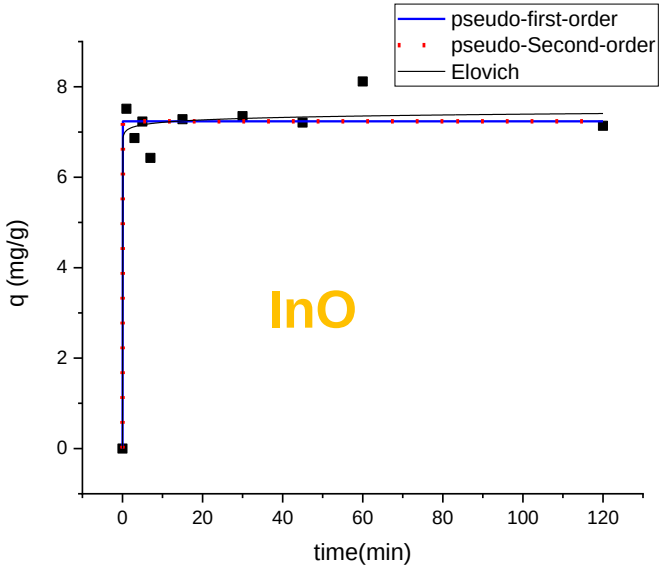


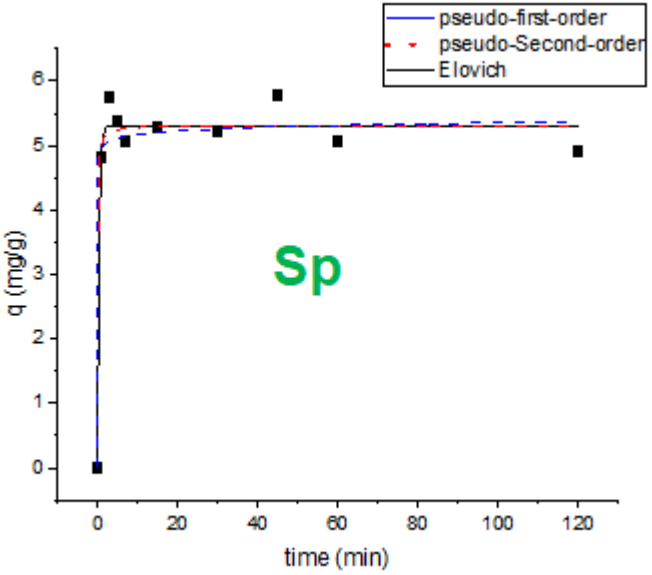


Results

Isotherms									
Model	Langmuir			Freundlich			Temkin		
parameters	q_m	b	R^2	K_F	n	R^2	b_T	a_T	R^2
spirulina	33.65	0.911	0.91	1.61	1.78	0.903	485.51	0.415	0.88
Indium salt	94.67	0.015	0.97	3.69	1.66	0.944	116.7	0.144	0.97

Kinetics' Study !





Results

Kinetics									
Model	Pseudo-First-Order			Pseudo-Second-Order			Elovich		
parameters	q_e	k_1	R^2	q_e	k_2	R^2	A	b	R^2
spirulina	5.30	2.41	0.97	5.31	3.11	0.96	3.54	12.73	0.53
Indium salt	7.23	155	0.961	7.23	2.4	0.961	5.681	12.7	0.964

Conclusion

- High Sensitive analytical techniques as Neutron Activation Analysis (NAA) and Inductive coupled plasma (ICP-OES).
- Effect of different parameters on removal of Terbium was accessed (pH ,Time, Temperature and Concentration) .
- Adsorption removal process was rapid for both sorbents but regarding temperature independent for spirulina and dependent for Indium salt.
- Langmuir model fitted better the data for both of sorbents but the adsorption capacity of indium salt was 3X higher than for *Spirulina* .
- Kinetic data refer that Pseudo-First-Order model fitted well with spirulina and Elovich model for Indium Salt which devoted to chemical sorption .

Thank You!