



# Reasons for the low availability of As in a paddy soil with high As content

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## Introduction

- The arsenic (As) content in the soils of Guandu Plain, Taiwan, can be as high as approximately 500 mg kg<sup>-1</sup> but the concentration of As in the rice grains harvested in this area is relatively low.
- To understand the reasons of low As availability in Guandu soils, submerging incubation experiment was conducted and the chemical compositions in the soil solutions were monitored as a function of time.

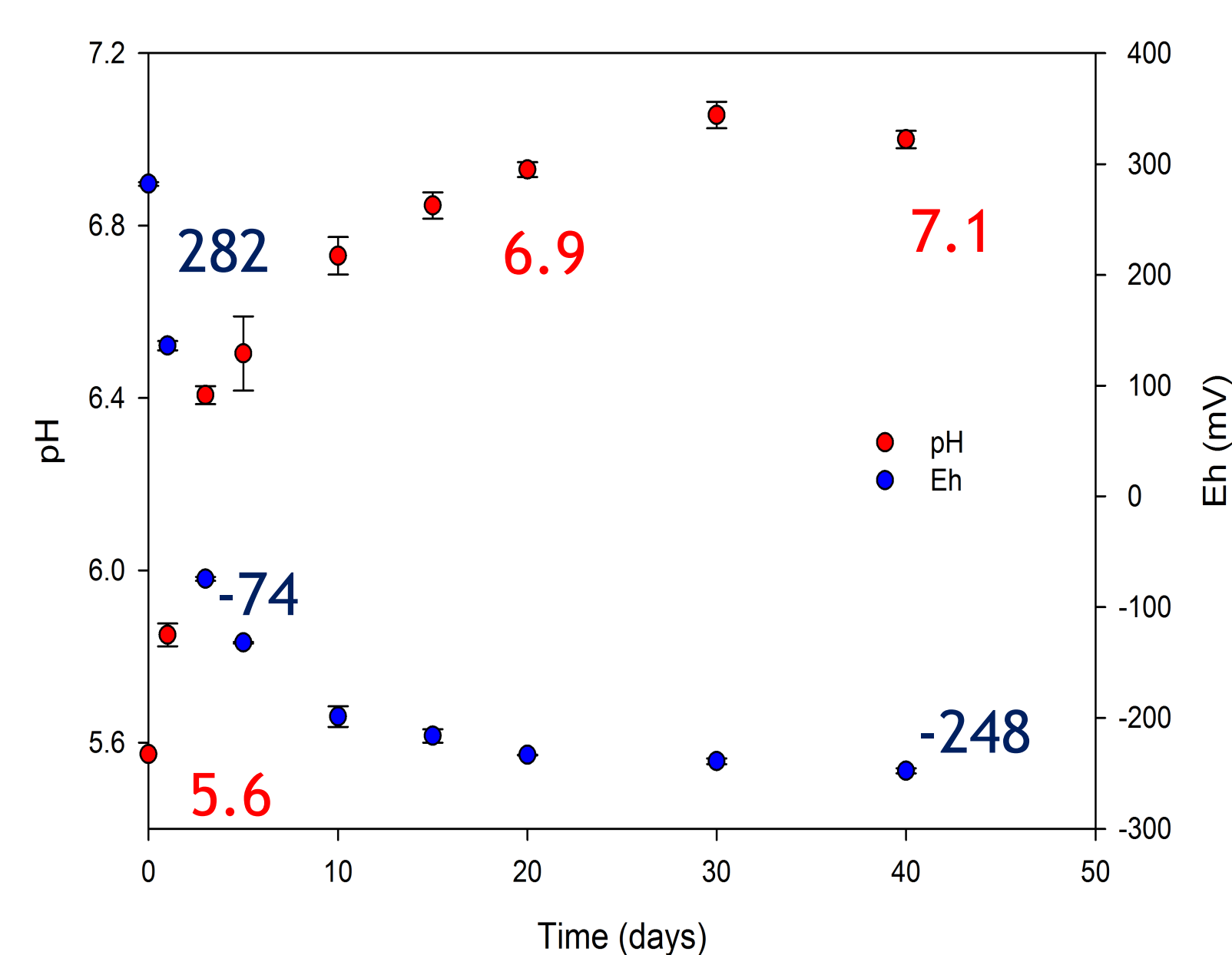
## Material & Methods

- ◆ Incubation Experiment
- ◆ Analysis of total Fe/As and Fe(II)/Fe(III) & As(III)/As(V) speciation
- ◆ As Sequential Extraction (Wenzel et al., 2001)
  - non-specifically sorbed
  - specially-sorbed
  - amorphous/poorly-crystalline hydrous oxides of Fe/Al
  - well-crystallized hydrous oxides of Fe/Al
  - residue
- ◆ Synchrotron XRF analysis

### phenomenon: high As conc. but low As availability

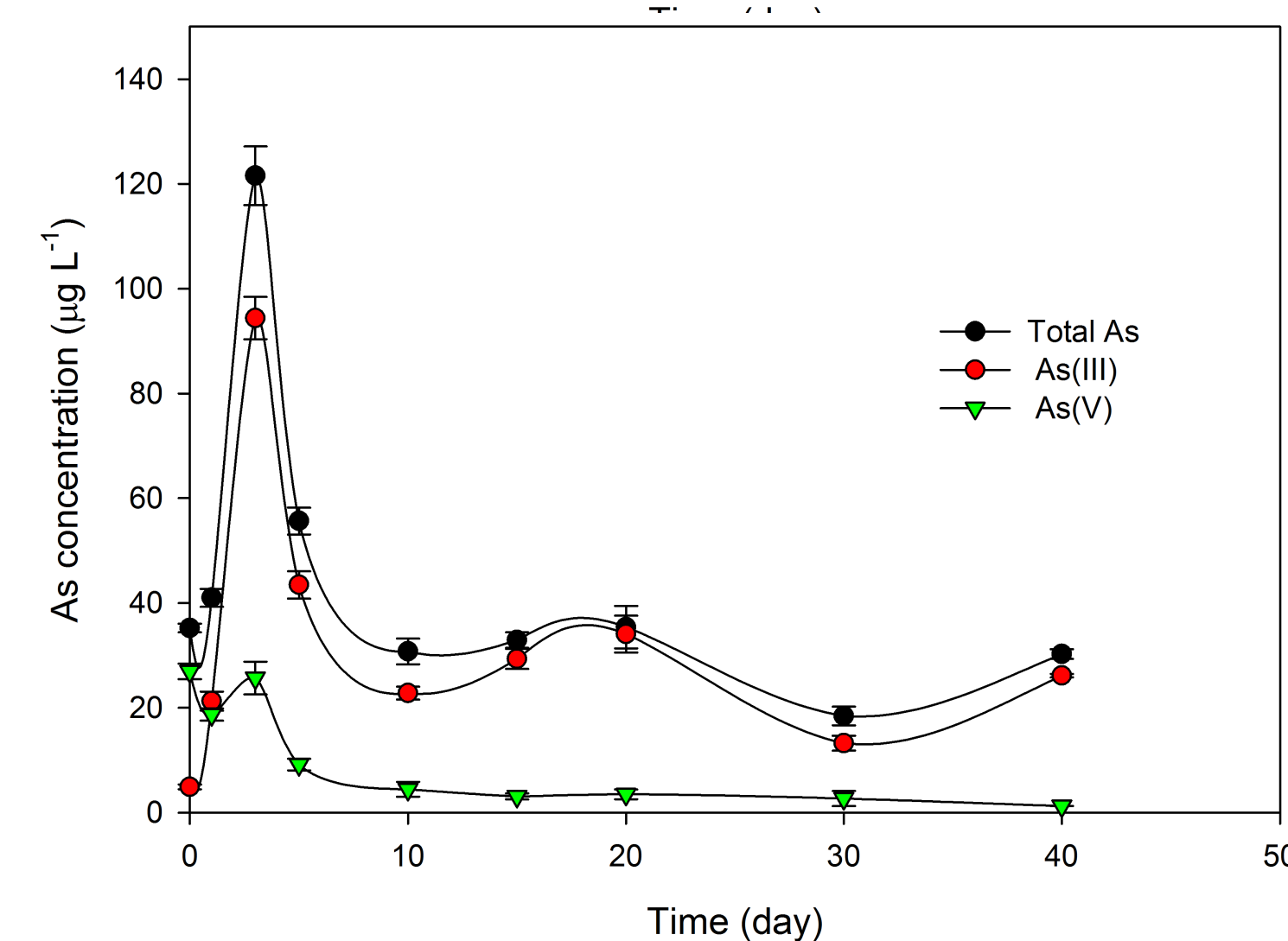
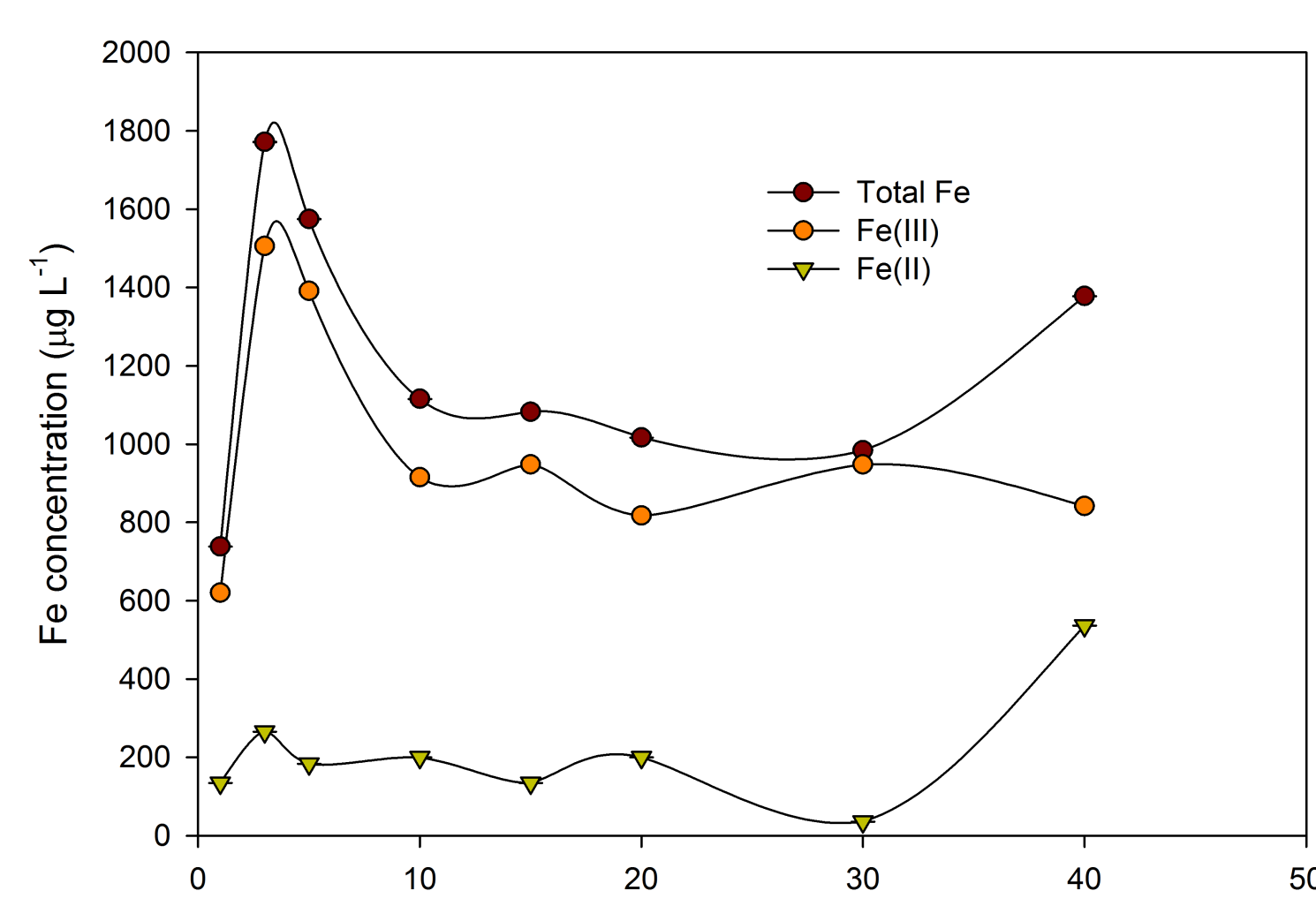
Country	Region	As concentration (mg kg <sup>-1</sup> )			Root/soil ratio	Grain/soil ratio
		Soil	Root	Grain		
Bangladesh	Rajshahi	27	--	1.84	--	0.07
	Rajshahi	16	--	1.75	--	0.11
China		15	20	2.2	1.3	0.15
France	Carmargue	8	10.2	0.32	1.3	0.04
Spain	Doñ ana	8	3.3	0.16	0.4	0.02
	Cadiz	2	1.4	0.13	0.7	0.07
U.S.A.	California	3	0.7	0.13	0.2	0.04
	Arkansas	6	1.6	0.2	0.3	0.03
Taiwan	Guandu	25 - 272	32 - 220	0.04 - 0.12	0.7	0.0005
<b>Taiwan</b>	<b>Guandu</b>	<b>378</b>	<b>203</b>	<b>1.2</b>	<b>0.54</b>	<b>0.003</b>

### Submerging incubation of Guandu soil

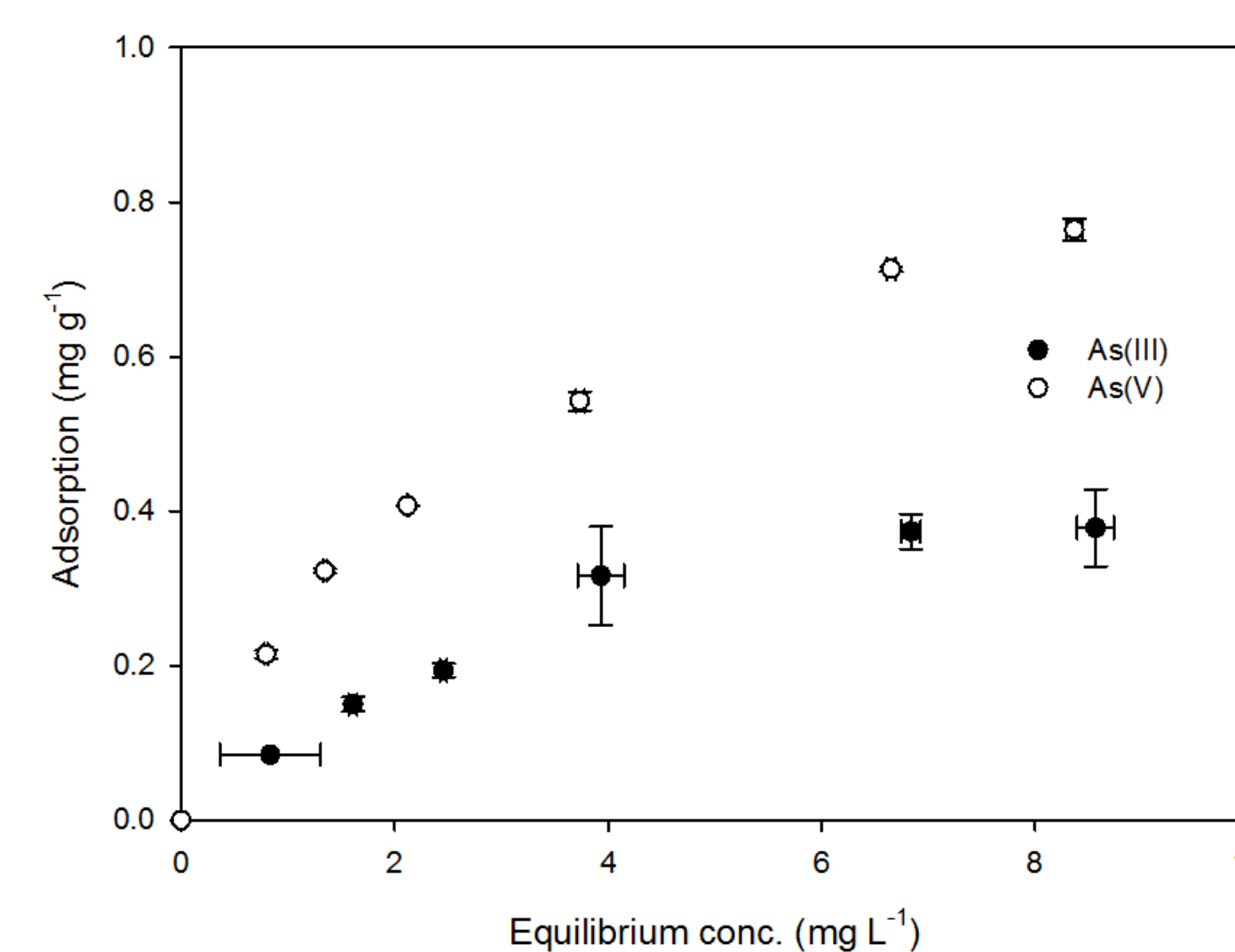


pH-Eh of Guandu soil during flooding incubation.

## Results & Discussion



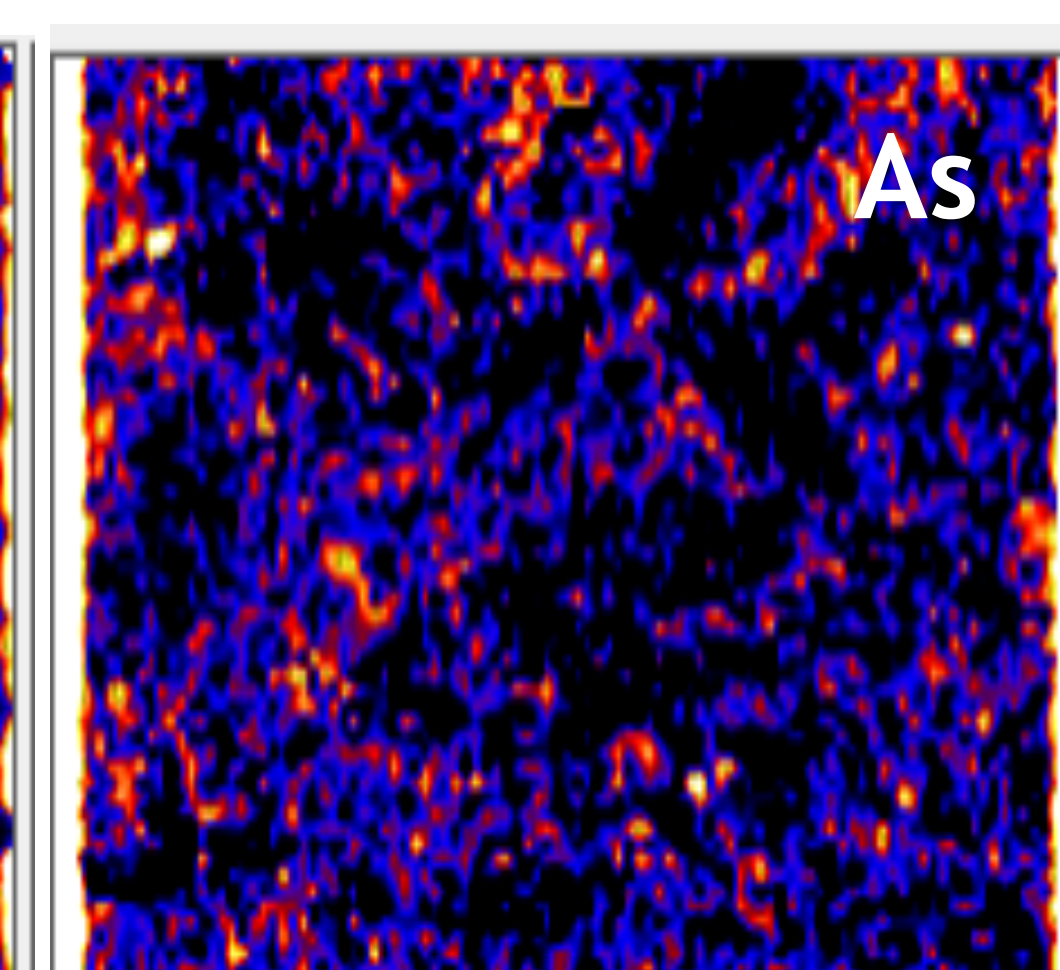
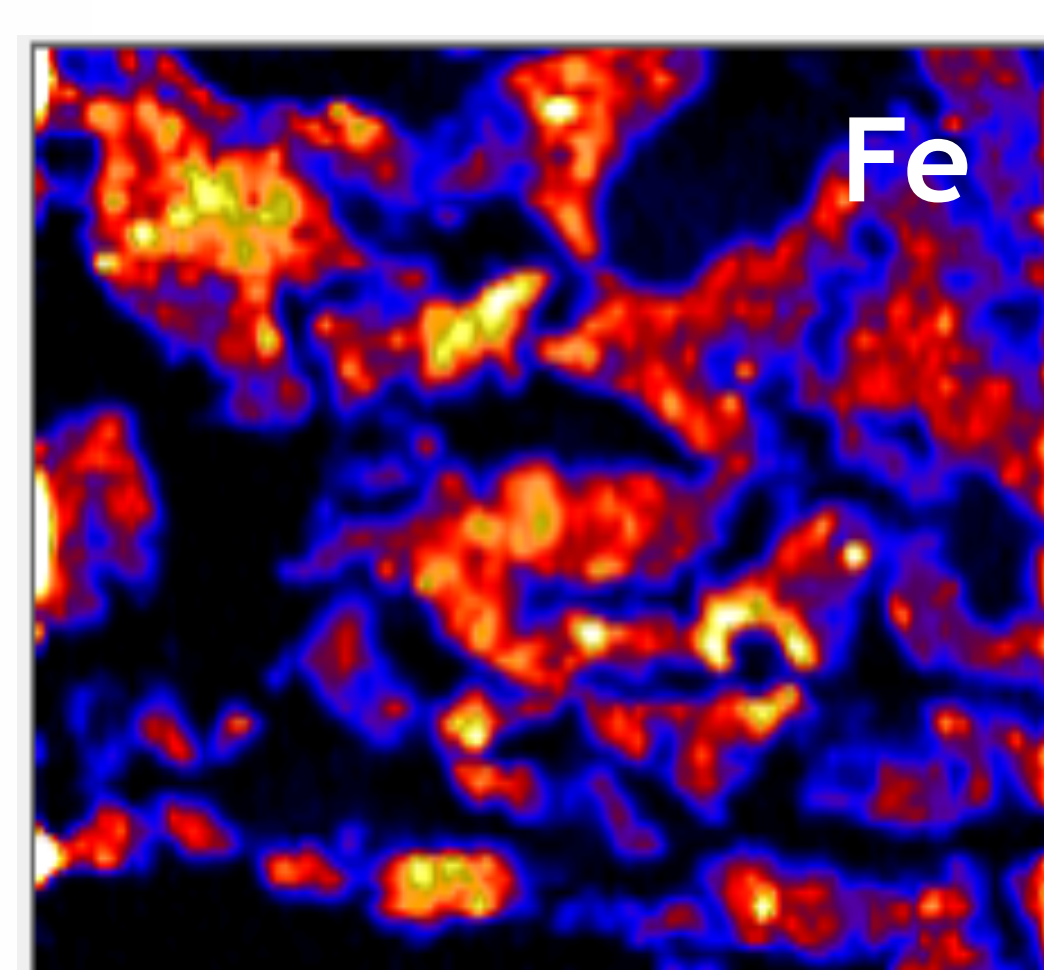
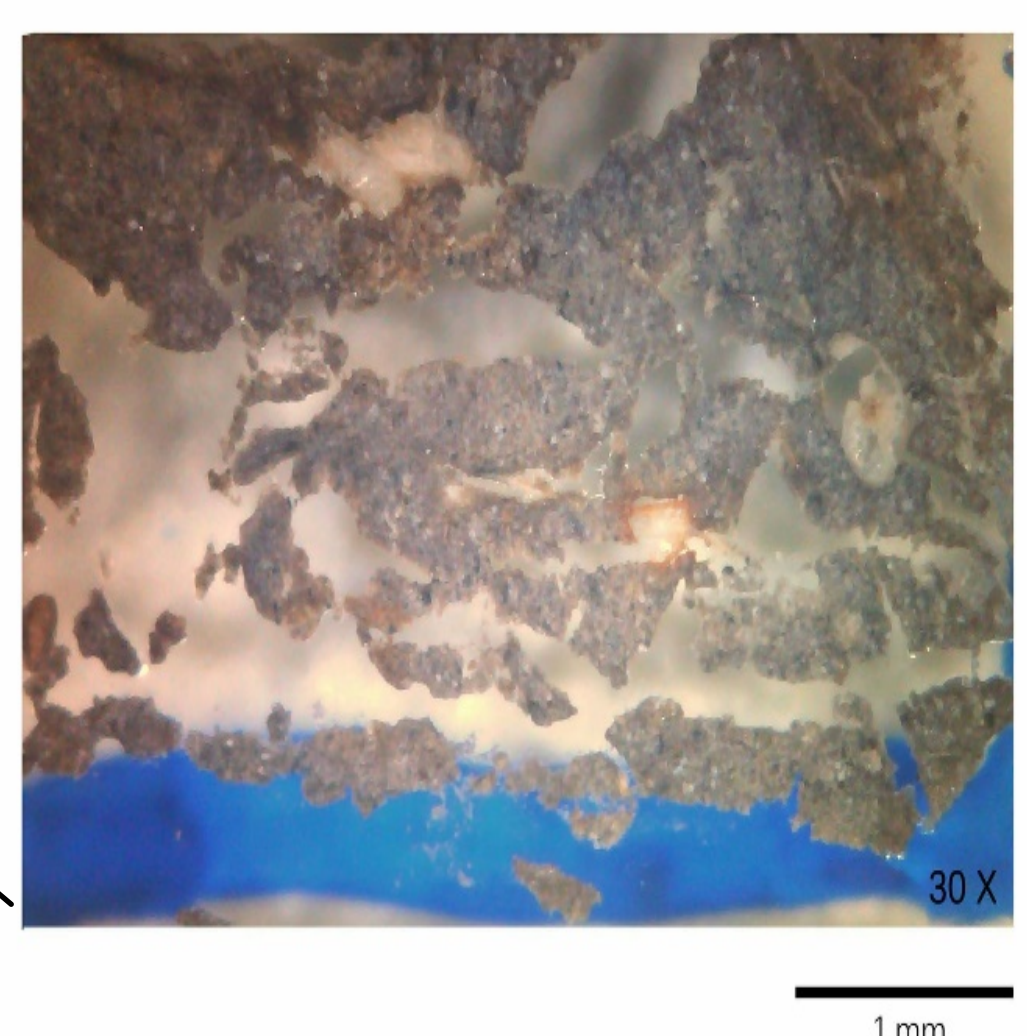
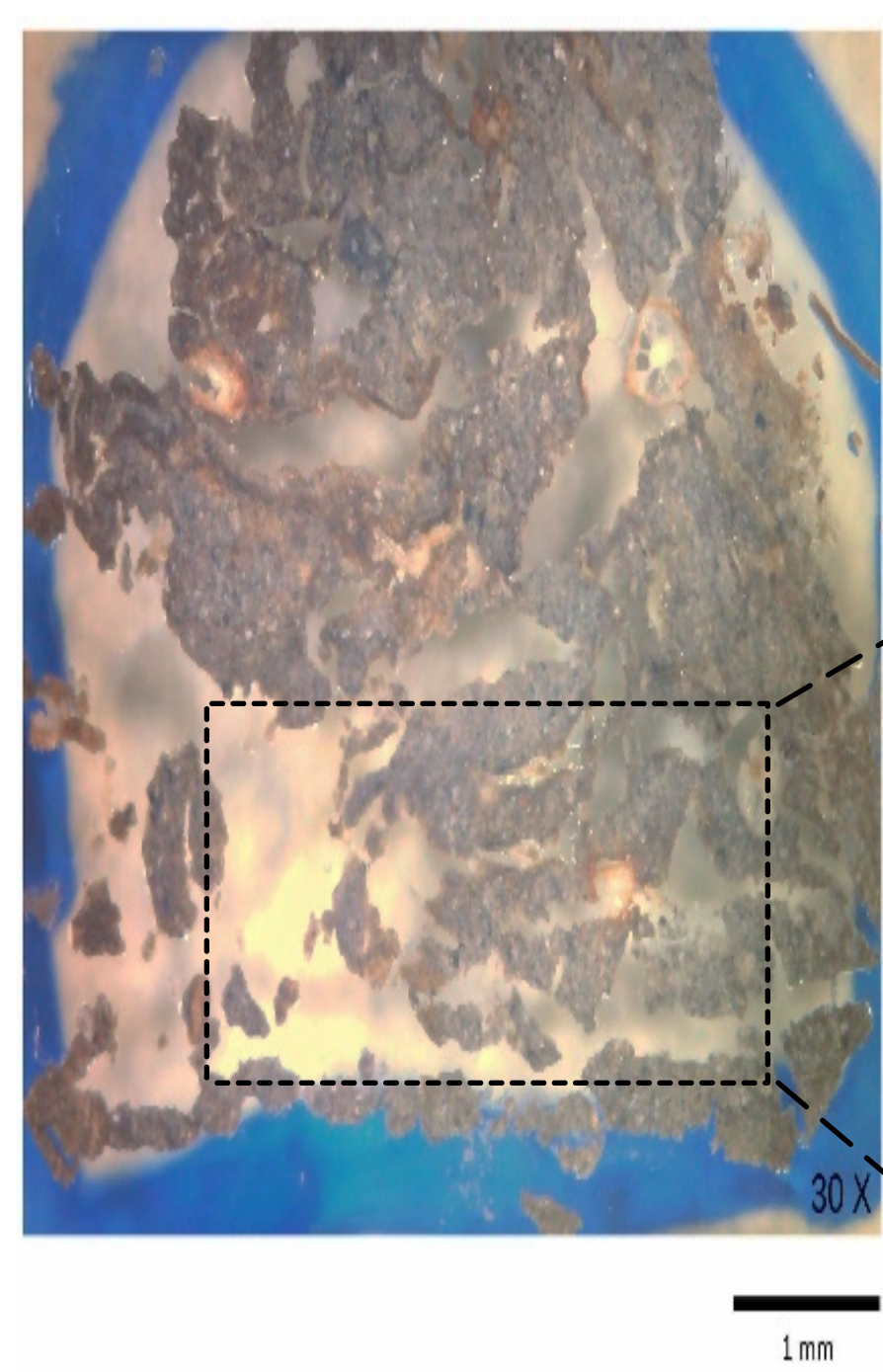
Fe/As speciation concentration in Guandu soil during flooding incubation.



Adsorption isotherm of As (V) and As (III) with Guandu soil in an initial 1-10 mg L<sup>-1</sup> As concentration.

Time (day)	As/Fe (%)
1	5.6
3	6.9
5	3.5
10	2.8
15	3.0
20	3.5
30	1.9
40	2.2

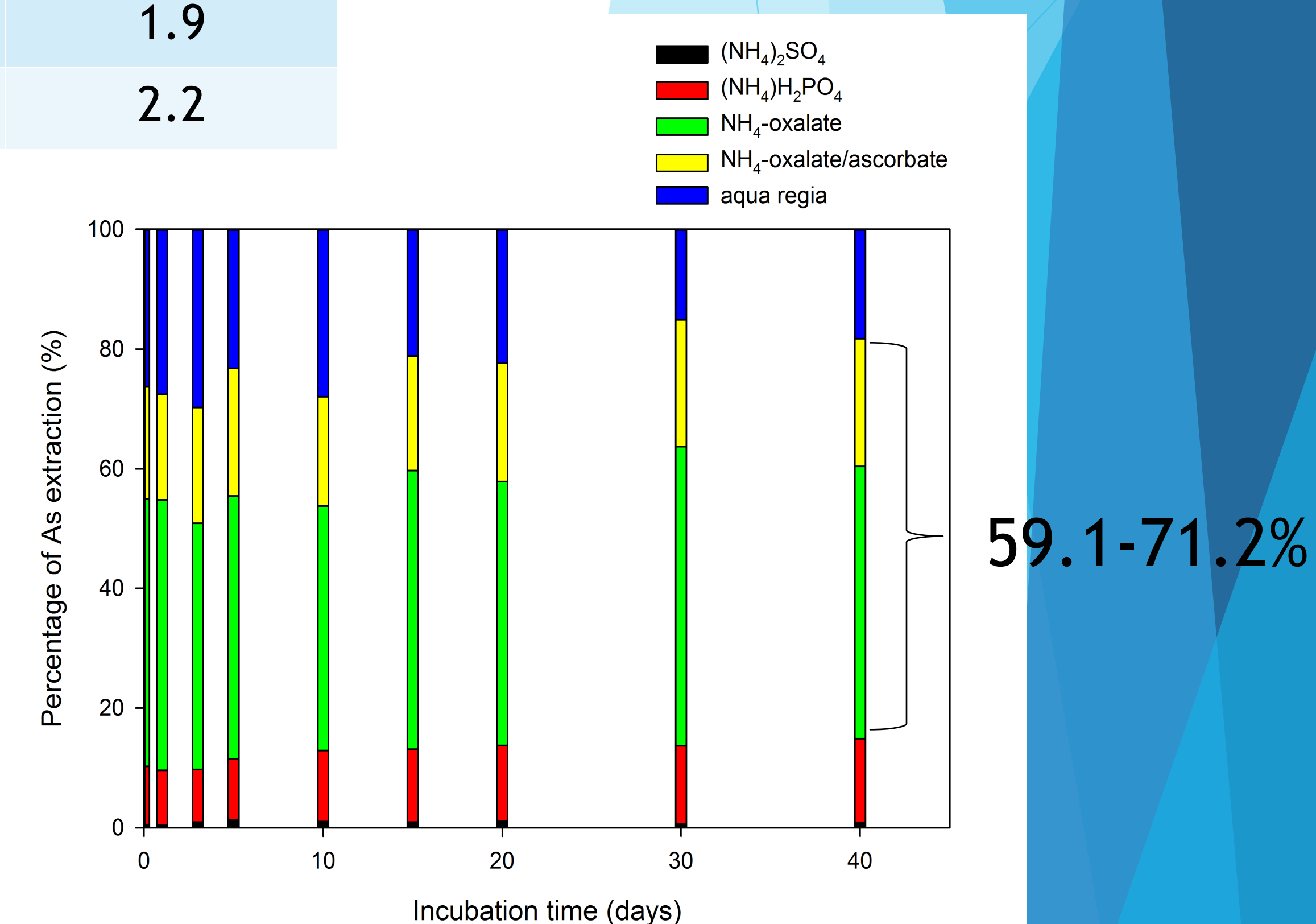
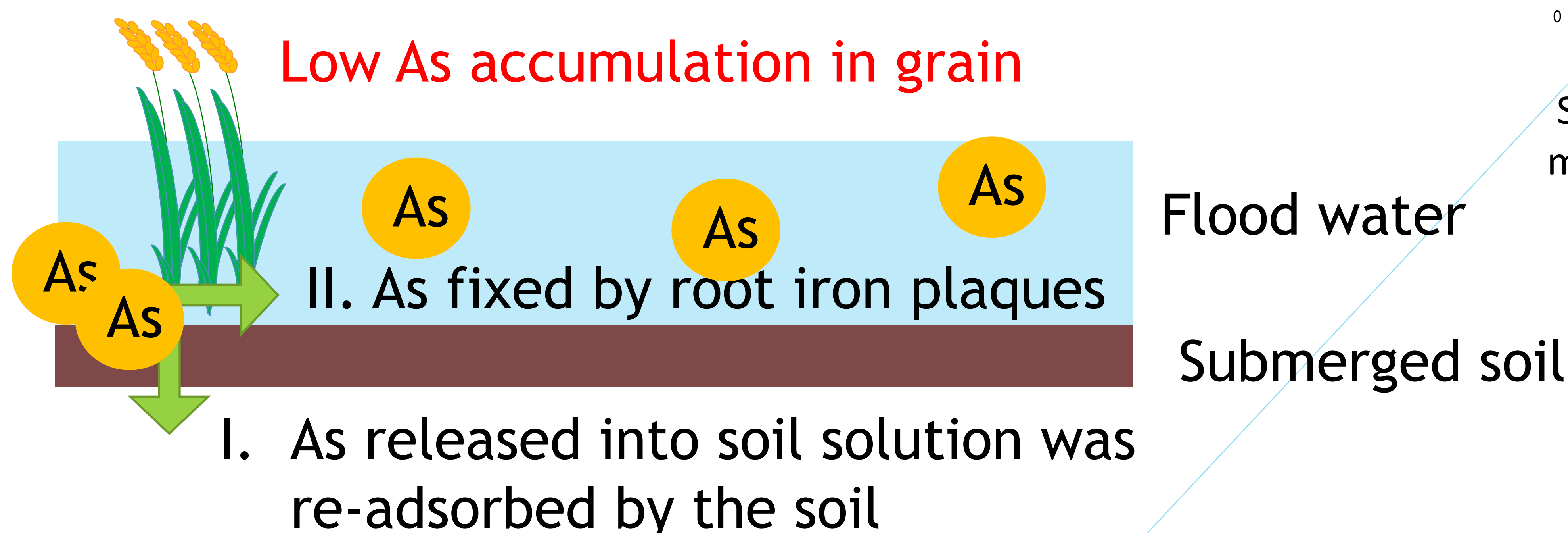
The change of As/Fe ratio versus with incubation period



Synchrotron XRF analysis of Fe/As distribution in rhizosphere

## Results & Discussion

### Low As accumulation in grain



Sequential extraction of As using Wenzel method

