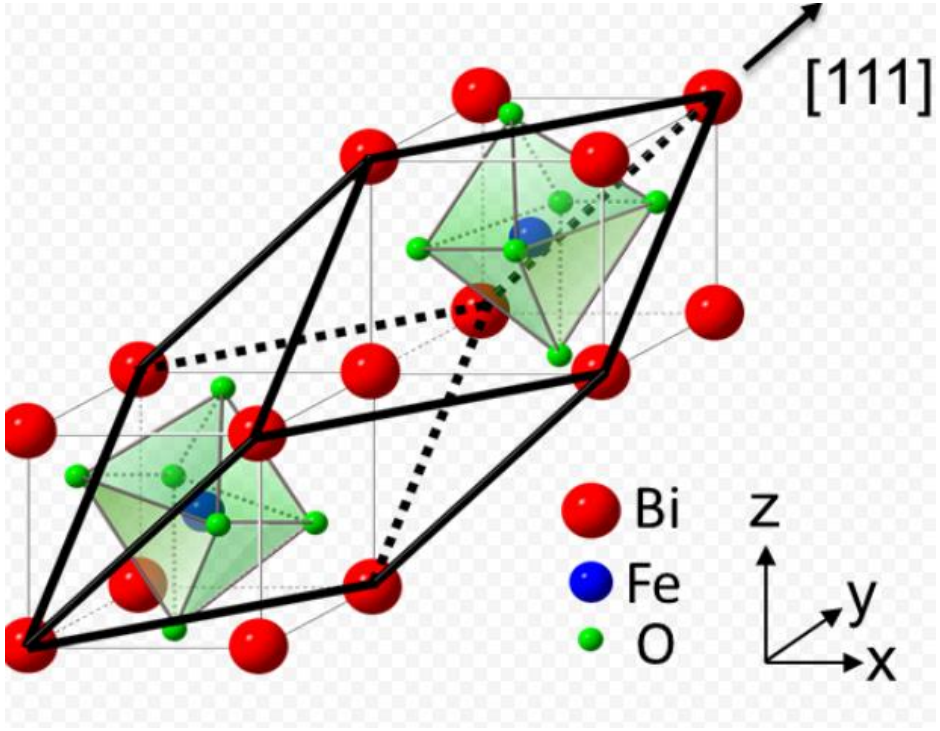
Сегодня: воскресенье, 17 марта 2019 г.

Workshop 4



General characteristics of the crystals

Associated Professor of National Research Tomsk Polytechnic University, Kuprekova E.I.

Part 1. Presentation

Task 1. Present your homework. Please follow the plan

Introduction

- **Tell the audience what you are going to say!**

Welcome audience → Introduce yourself → Say what the topic is → Explain why audience will be interested

Main part

- **Say it!**

I've divided my presentation into tree (main parts): x, y, and z.
In my presentation I'll focus on three major issues.
First (of all), I'll be looking at…. , second…. , and third … .
I'll begin/start off by explaining …. .
Then/Next/After that, I'll go on to … .
Finally, I'll offer some solutions.

Conclusion

- **Tell them what you said!**

Signal the end of your talk → Summarize the key points → Explain the significance → Make your final statement → Invite questions

Today’s topic is … .

Appendix 1

CHECKLIST FOR INTRODUCTIONS

1. Welcome the audience
2. Introduce yourself (name, position/function)
3. State your topic
4. Explain why your topic is important for the audience
5. Outline the structure of your talk
6. Let the audience know how you're organizing the presentation

Appendix 2

CHECKLIST FOR THE MAIN PART OF A PRESENTATION

1. Briefly state your topic again
2. Explain your objective(s)
3. Signal the beginning of each part
4. Talk about your topic
5. Signal the end of each part
6. Highlight the main points
7. Tell listeners you've reached the end of the main part

Signposting

Saying what is coming

1. *In this part of my presentation, I'd like to tell you about …. .*
2. _____

Moving on the next point

1. *This leads directly to the next part of my talk*
4.

Indicating the end of a section

1. *This brings me to the end of my second point*
2. _____

Referring back

1. *As I mentioned before,….*
2. *Let's go back to what we were discussing earlier*

Summarizing a point

I'd like to sum up the main points.

Let me briefly summarize what I've said so far.

CHECKLIST FOR VISUALS

✓1. Prepare each visual carefully and separately

✓2. Check whether the visual really shows what you are saying

✓3. Make sure your audience can read the visual (font size and colors)

✓4. Find effective headlines

✓5. Keep design and content simple

✓6. Reduce text to a minimum

✓7. Always prepare audience for visuals

✓8. Present information clearly and logically

EFFECTIVE CONCLUSIONS

Using questions

After all, isn't why we're here?
Let me just finish with a question:
if we don't do it, won't somebody else?

Referring back

Remember what I said at the beginning of my talk today?
Well, ….
Remember, ….
Let me just go back to the story I told earlier

Quoting a well-known person

As…. once said, …
To quote a well-known scientist

Part 2. The rationale of the lattice type of the crystal structure

To determine the lattice type in the structure we must include it to one of the six crystal systems.

Belonging to a particular crystal system is fixed with certain elements of symmetry

- **"axis of symmetry " (n = 2, 3, 4, 6), rotational and screw axis,**
- **the "plane of symmetry“, plane of sliding and mirroring**

Cubic	**the triad axis directed along (or in parallel) three-dimensional diagonals of the cell**
Hexagonal	**the triad or hexad axis**
Tetragonal	**the tetrad axis**
Orthogonal	**There are two mutually perpendicular planes of symmetry parallel to the coordinate planes, or two crossed at right angle the diad axes parallel to coordinate axes**
Monoclinic	**one dead axis of symmetry or plane of symmetry**
Triclinic	**lack of any elements of symmetry except axes of translation and the centers of inversion**

The nature of centrifuge depends on the method of placement of nodes in the unit cell:

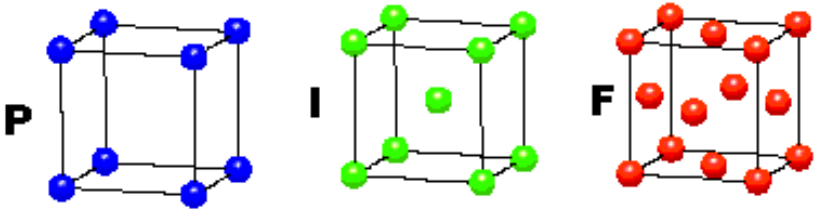
Unit cell	symbol	description
Primitive	P	nodes only at the vertexes of the cell
Body-centered	I	an extra node in the center of the volume
Base - centered	C (A, B)*	additional nodes at the centers of two opposite faces
Face-centered	F	additional nodes at the centers of all faces
Double Body-centered	R	two additional node of the volume diagonal divide it into three equal diagonal cut

*Symbol C belongs to a cell at which *ab* side is aligned; cells with additional nodes on sides of *bc* and *ac* are designated by A and B respectively.

CUBIC

$a = b = c$

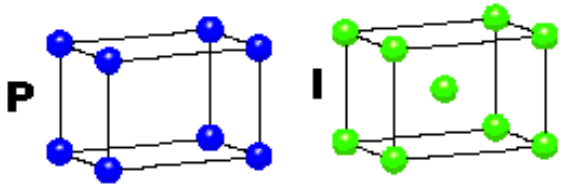
$\alpha = \beta = \gamma = 90°$



TETRAGONAL

$a = b \neq c$

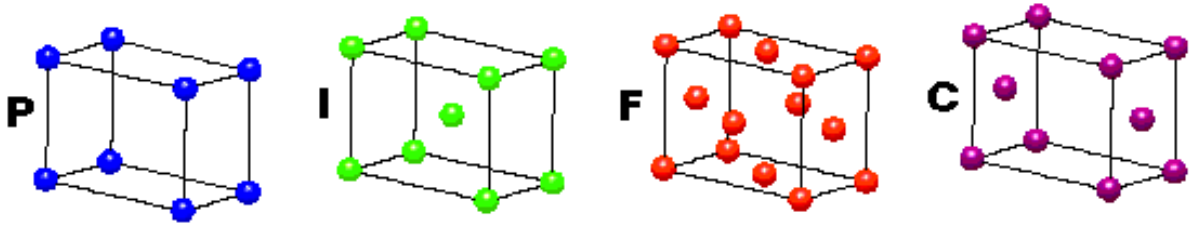
$\alpha = \beta = \gamma = 90°$



ORTHORHOMBIC

$a \neq b \neq c$

$\alpha = \beta = \gamma = 90°$

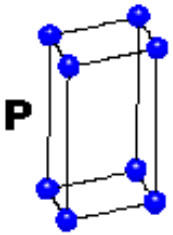


HEXAGONAL

$a = b \neq c$

$\alpha = \beta = 90°$

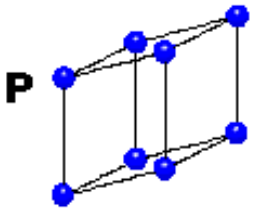
$\gamma = 120°$



TRIGONAL

$a = b = c$

$\alpha = \beta = \gamma \neq 90°$

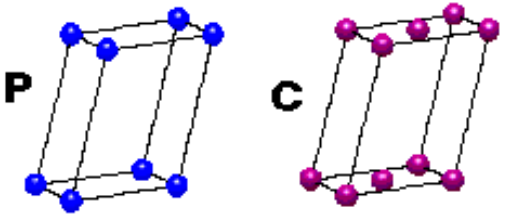


MONOCLINIC

$a \neq b \neq c$

$\alpha = \gamma = 90°$

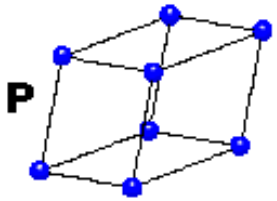
$\beta \neq 120°$



TRICLINIC

$a \neq b \neq c$

$\alpha \neq \beta \neq \gamma \neq 90°$



4 Types of Unit Cell
P = Primitive
I = Body-Centred
F = Face-Centred
C = Side-Centred
+
7 Crystal Classes
→ 14 Bravais Lattices

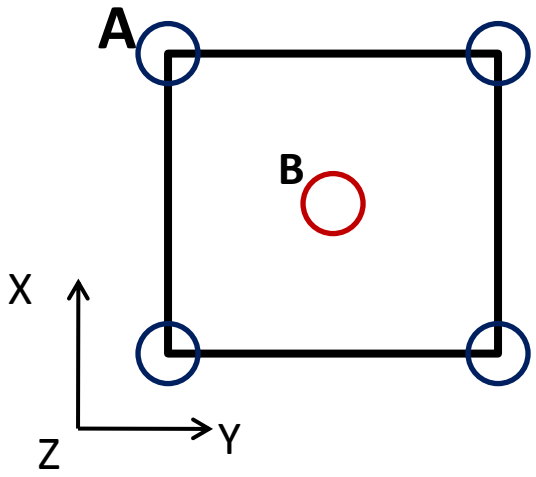
Example

Task: **Specify a structural class of a crystal structure. Consider two different situation**

***1. A* and *B* - atoms of different elements,**

***2. A* and *B* - atoms of one element.**

Specify lattice type.



Cell parameters

$$a = b \neq c$$

$$\alpha = \beta = \gamma = 90^0$$

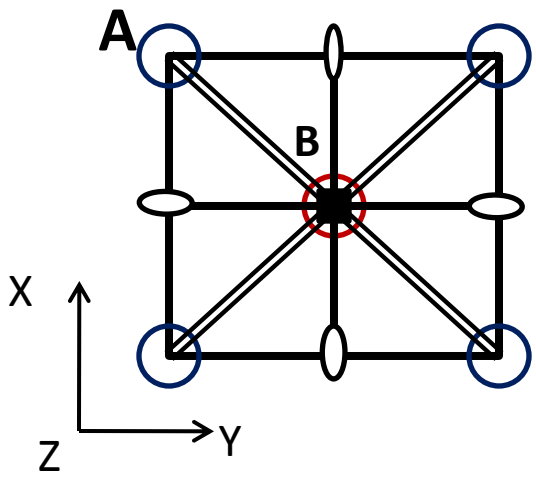
Atom coordinates

A $0, 0, 0$

B $\frac{1}{2}, \frac{1}{2}, z$

Solution: Lattice type is tetragonal P. 4-fold axes exist in parallel orientation. Nodes are only at the vertexes of an unit cell.

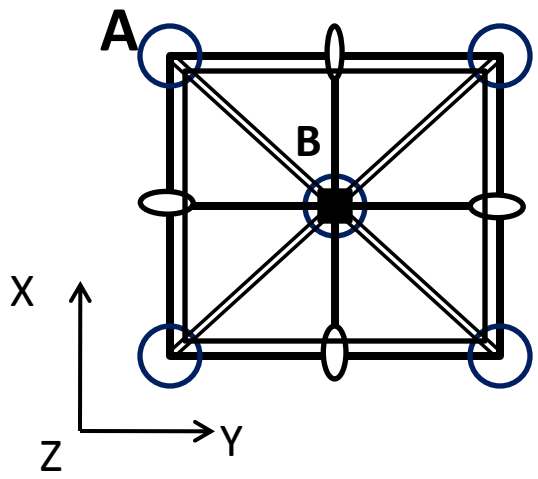
1) $A \neq B$



$P\,4\,m\,m$

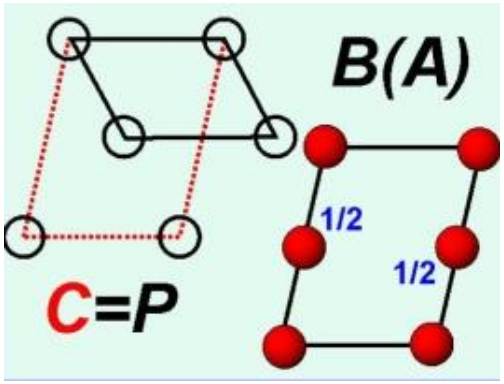
$Z = 1$

2) $A = B$



$P\,4/n\,m\,m$

$Z = 2$



NOTE: It is necessary to consider only "generating" elements of symmetry (specified in a symbol of group)

Part 4. *Student's work*

Q1. **Look at the picture of the Main building of Moscow State University. What symmetry elements can you find? Explain whether the crystal to have the same set of symmetry elements.**

Q2. **Tell what the crystal is. List its main macroscopic properties. Give the definition of these concepts. Do it orally in a presentation format.**

Q3. ***W*rite down a structural class of crystal structure. Consider two different situations:**

A and B - atoms of different elements,

A and B - atoms of one element.

Specify lattice type (write an explanation). Justification of the decision is the image of an arrangement of the major elements of symmetry against an arrangement of atoms (if at the same time drawing is overloaded, it is possible to represent an arrangement of elements of symmetry separately).

Q4. **Describe how to index a lattice plane.**