

**HGS**

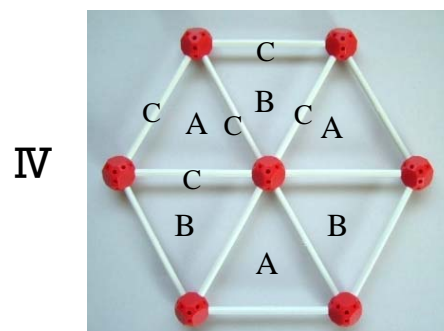
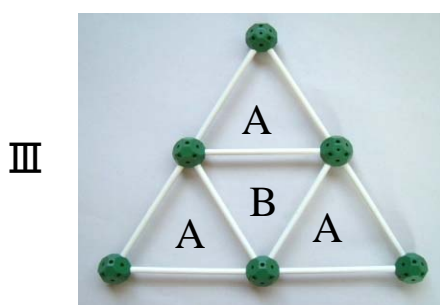
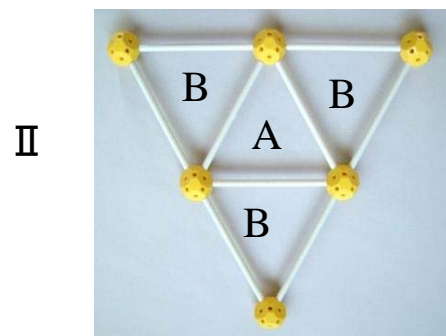
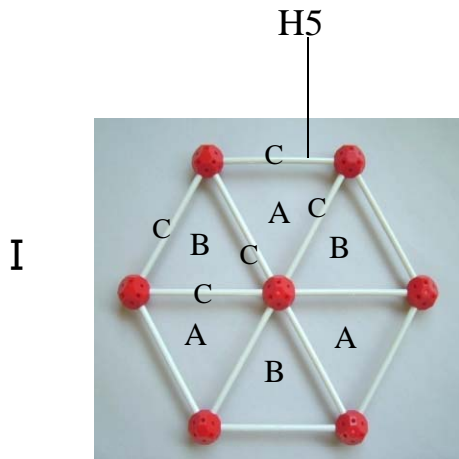
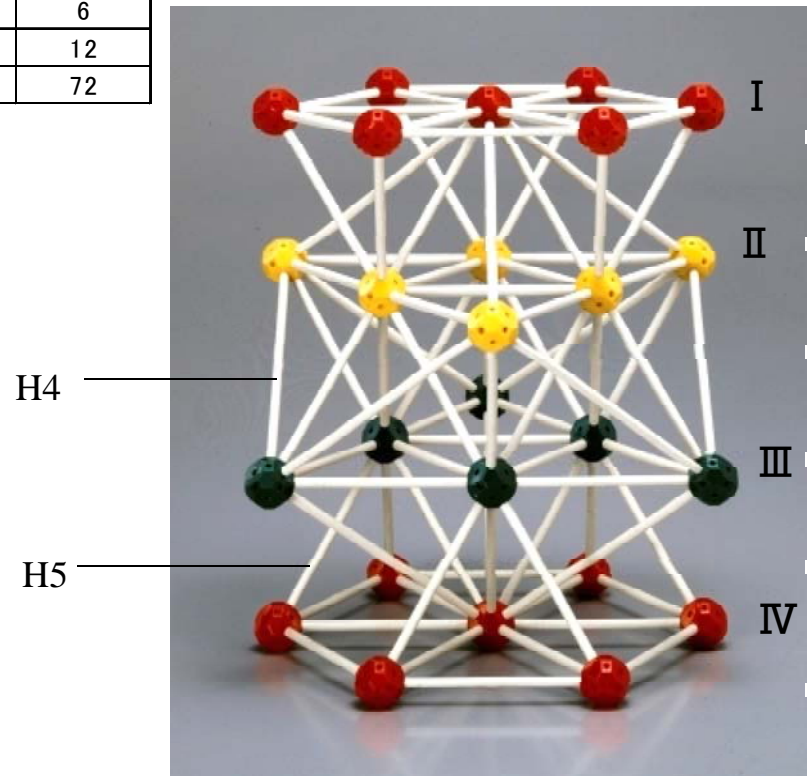
URL <http://www.hgs-model.com>

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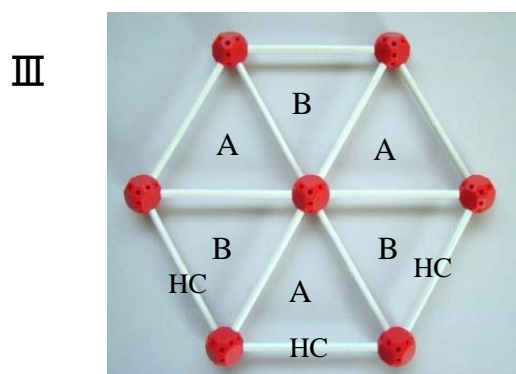
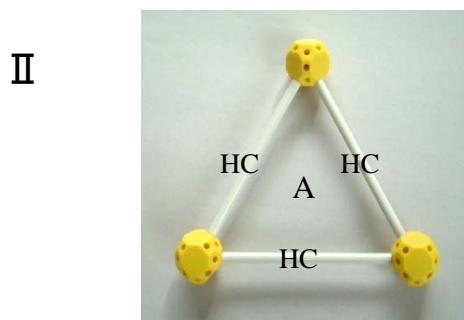
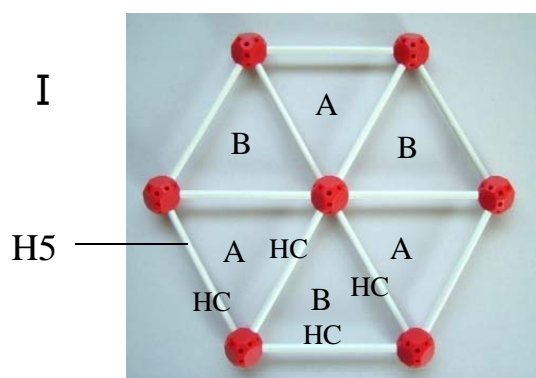
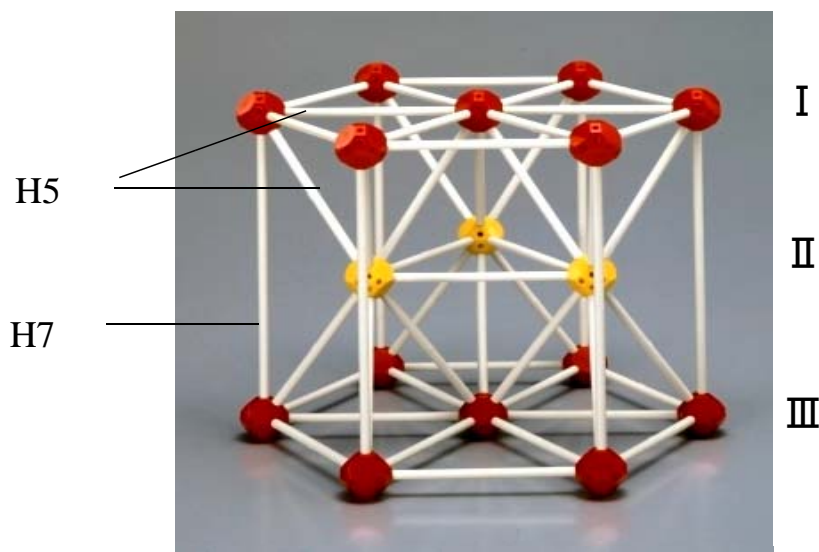
## P2 Face centered cubic closest packing

	Item No.	Parts No.	Color	Qty
Atom	32-R	LM <sup>18</sup>	Red	14
	32-Gn	LM <sup>18</sup>	Green	6
	32-Y	LM <sup>18</sup>	Yellow	6
Bond	H4		White	12
	H5		White	72



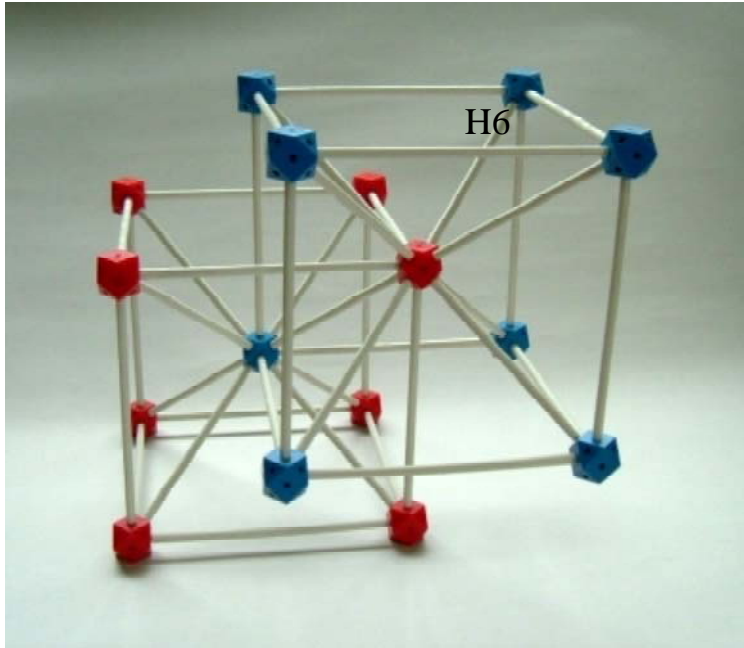
# Hexagonal closest packing

	Item No.	Parts No.	Color	Qty
Atom	H36-Y	LM <sup>20</sup>	Yellow	3
	H36-R	LM <sup>26</sup>	Red	14
Bond	H5		White	45
	H7		White	6

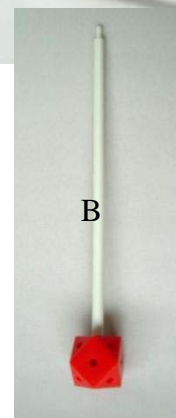
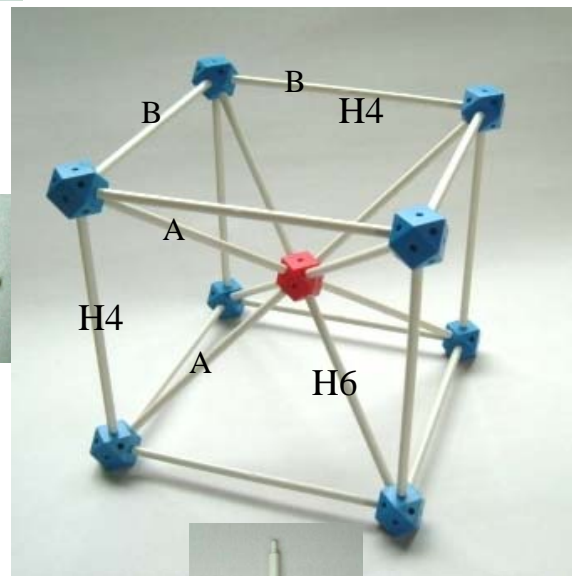
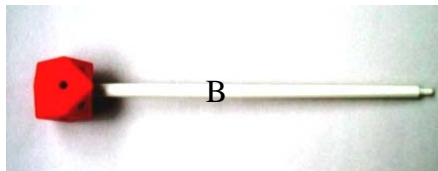


P4 Body centered cubic closest packing

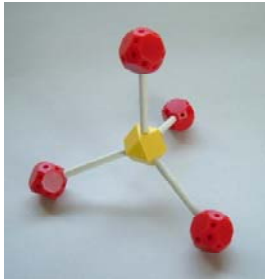
H4



	Item No.	Parts No.	Color	Qty
Atom	28	LM14	Blue	8
	29	LM14	Red	8
Bond	H4		White	24
	H6		White	15



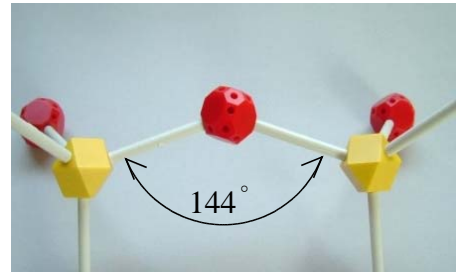
# The basic form of silicates



Tetrahedral



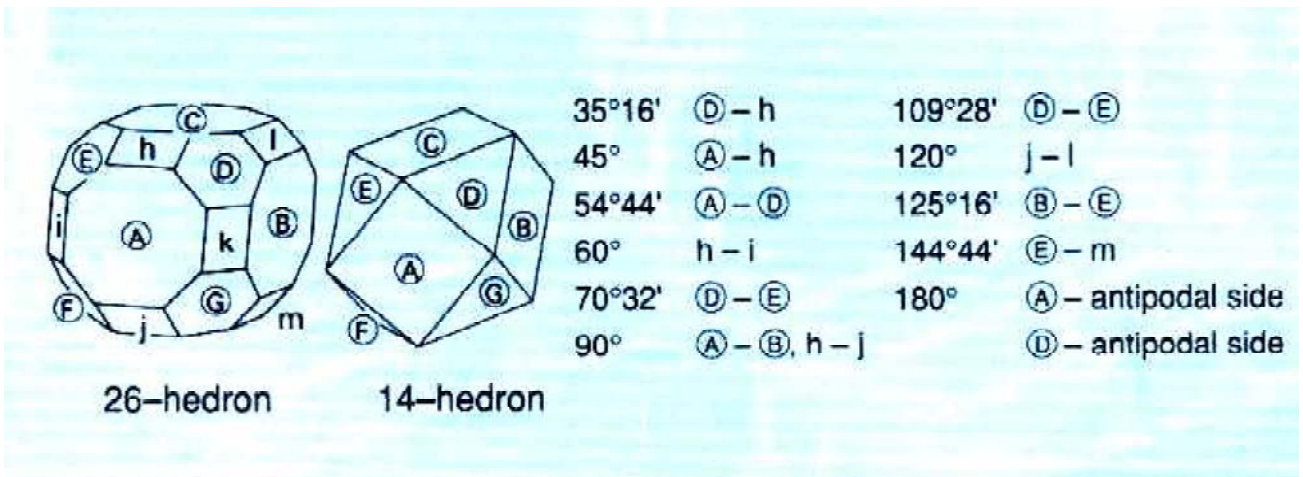
Octahedral



Si - O - Si angle

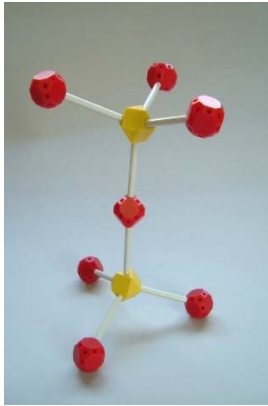
Note. Since the parts of octahedral are not contained in this model, please use a supplementary parts.

## The bond angles of HGS Polyhedron atoms

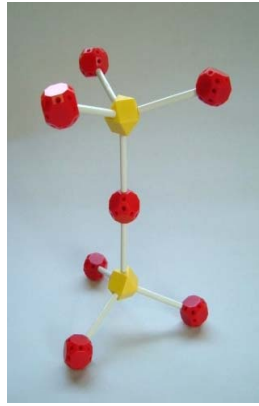


P6

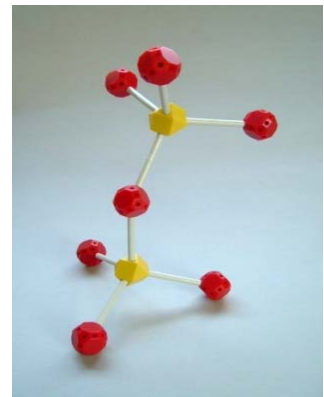
# Cilica(SiO<sub>2</sub>)--- structure



I

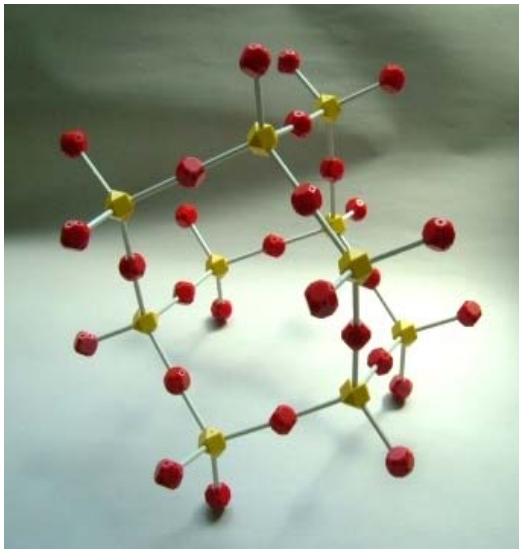


II

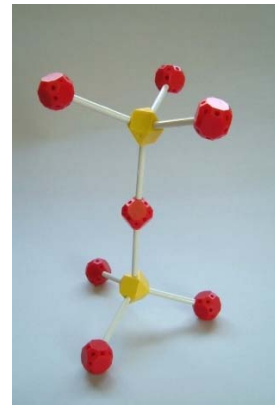


III

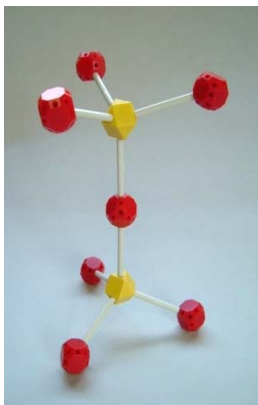
## $\beta$ -Cristbalite and $\beta$ - Tridymite



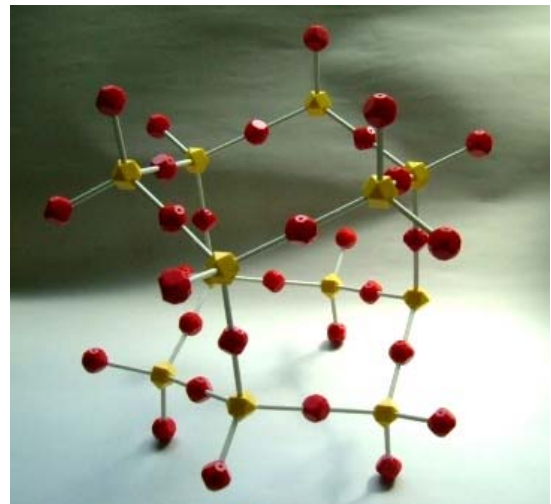
$\beta$  -Cristbalite



I



II

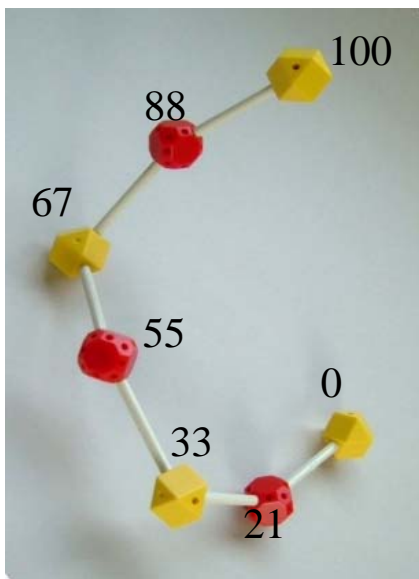
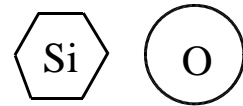


$\beta$  - Tridymite

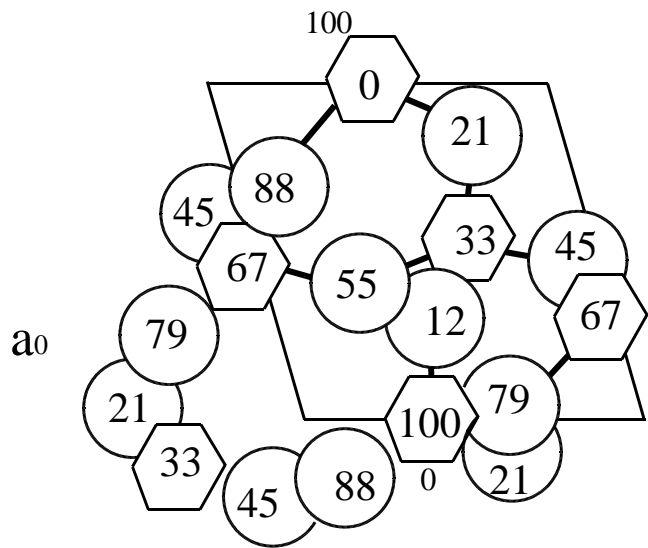
Rock crystal(SiO<sub>2</sub>) structure(1)

A right figure is equally divided into 100 upwards from space, when space is set to 0, and it expresses height numerically.

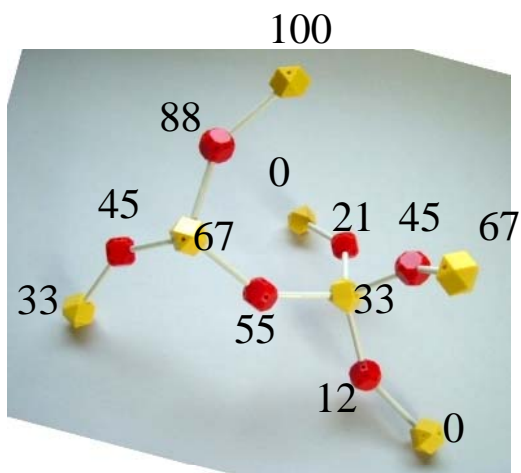
A circle is oxygen and a hexagon is silicon.



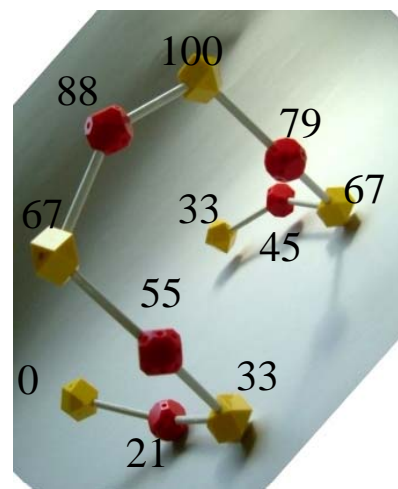
I



a<sub>0</sub>



II

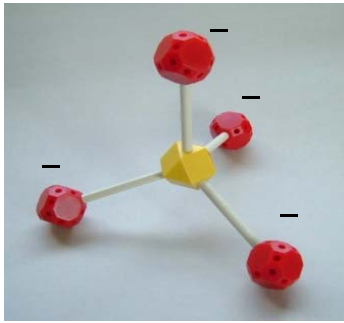


III

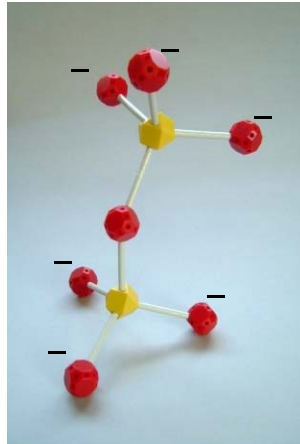


# Silicate ion--tetrahedral structure( $\text{SiO}_4$ )

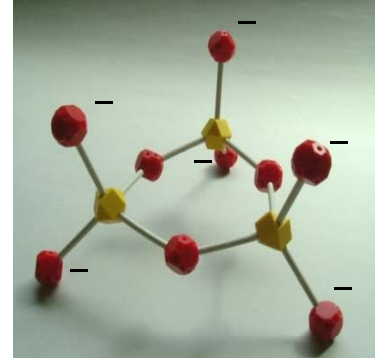
Note; The parts of octahedral structure ( $\text{SiO}_6$ ) are not contained  
Please use a supplementary parts.



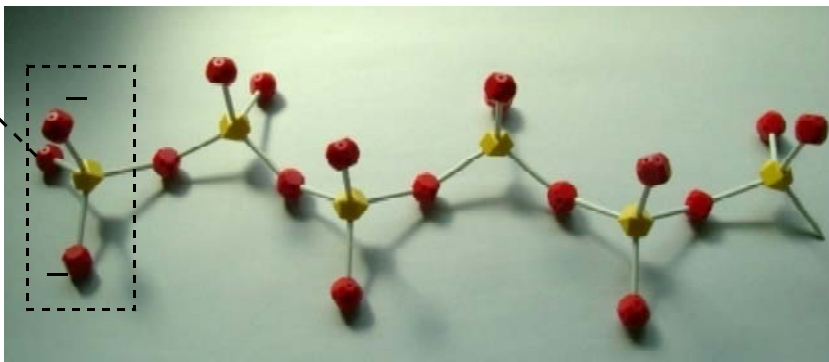
$[\text{SiO}_4]^{4-}$



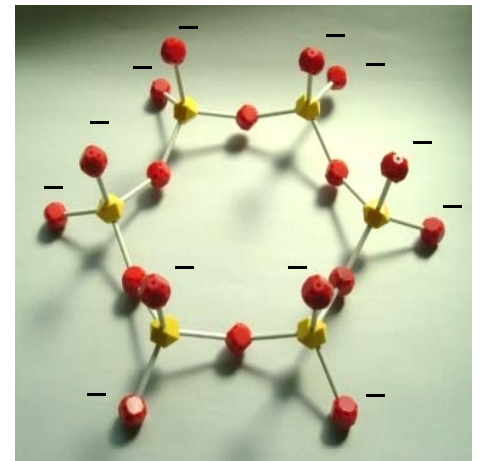
$[\text{Si}_2\text{O}_7]^{6-}$



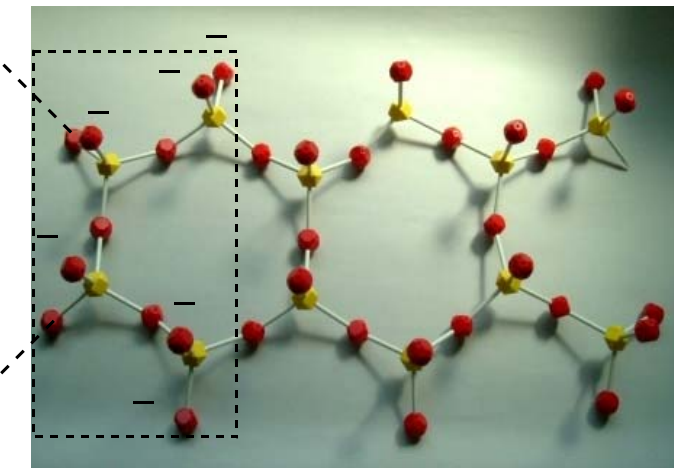
$[\text{Si}_3\text{O}_9]^{6-}$



$[(\text{SiO}_3)_n]^{2n-}$



$[\text{Si}_6\text{O}_{18}]^{12-}$



$[(\text{Si}_4\text{O}_{11})_n]^{6n-}$

Silicate ion	Silicate		
$[\text{SiO}_4]^{4-}$	Orthosilicate	Zircon	$\text{ZrSiO}_4$
$[\text{Si}_2\text{O}_7]^{6-}$	Pyrosilicate	Thortveitite	$\text{Sc}_2\text{Si}_2\text{O}_7$
$[\text{Si}_3\text{O}_9]^{6-}$	Benitoite etc.	Benitoite	$\text{BaTiSi}_2\text{O}_9$
$[(\text{SiO}_3)_n]^{2n-}$	Pyroxene etc.	Diopside	$\text{CaMg}(\text{SiO}_3)_2$
$[\text{Si}_6\text{O}_{18}]^{12-}$	Beryl etc.	Beryl	$\text{Ba}_3\text{Al}_2\text{Si}_6\text{O}_{18}$
$[(\text{Si}_4\text{O}_{11})_n]^{6n-}$	Amphibole etc.	Tremalite $\text{Ca}_2\text{Mg}_2(\text{Si}_4\text{O}_{11})_2(\text{OH})_2$	

## Contents of Closest Packing Set

### ●Atom

Atom No.	Color	Parts code	Bond angle	Use	Quantity
24	yellow	LS4	109° 28'	$sp^3$	28
28	blue	LM14	90° 109° 28' 125° 156'	$sp^2 dsp^3$	8
29	red	LM14	90° 109° 28' 125° 156'	$sp^2 sp^3 d^2 sp^3$	8
32-R	red	LM18	45° 60° 90°	$d^2 sp^3$	14
32-Gn	green	LM18	45° 60° 90°	$d^2 sp^3$	6
32-Y	yellow	LM18	45° 60° 90°	$d^2 sp^3$	6
34-R	red	LM20	45° 60° 90° 109° 28' 144° 16'	$sp^2 sp^3 dsp^3$	82
H36-Y	yellow	H LM20	45° 60° 90° 109° 28' 144° 16'	$sp^2 sp^3 dsp^3$	3
H36-R	red	H LM20	45° 60° 90° 109° 28' 144° 16'	$sp^2 sp^3 dsp^3$	14

### ●Bond

Bond distance			Use	Quantity
No.	A	ratio		
H2	2.34	$\sqrt{3}/4$	Zn-S	91
H4	5.41	1	Framework of unit lattice (zincblende)	72
H5	3.82	$\sqrt{2}/2$	fcc	139
H6	4.67	$\sqrt{3}/2$	bcc	37
H7	6.24	$2/\sqrt{3}$	hcp	18

#### Note

The Closest Packing set is designed to make  $1 \text{ \AA} = 2.5 \text{ cm}$  in zink-blende crystals.

The magnification of bond distances of some of the other crystals is approximate one.

Consequently , bond distances shown in parentheses are not always the same as the bond distances in the crystals themselves, but are those in the models.