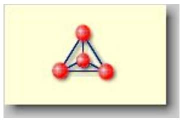
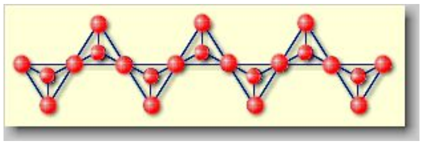
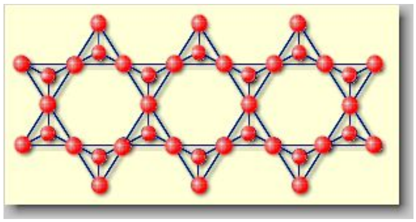
Silicate Structures



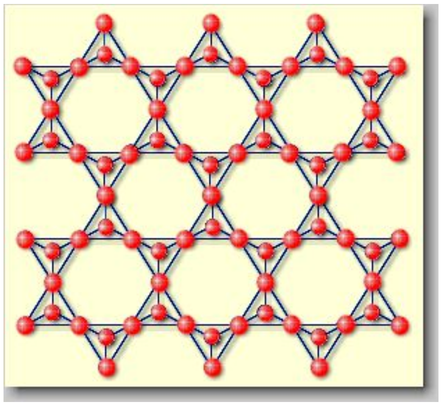
Isolated tetrahedron $[SiO_4]^{-4}$ The isolated $[SiO_4]^{4-}$-tetrahedra exist as independent units which are linked together by cations like Fe^{2+}, Mg^{2+} or Zr^{4+}. Examples are olivine $(Fe,Mg)_2[SiO_4]$, zircon $Zr[SiO_4]$, also the minerals of the garnet group like almandine $Fe^{2+}{}_3Al_2[SiO_4]$.



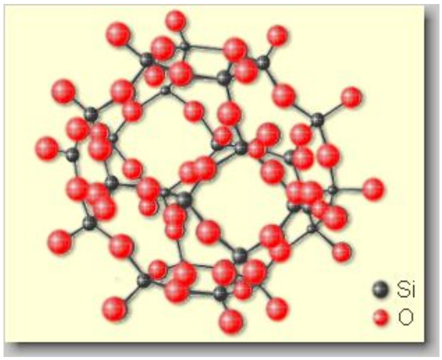
SingleChain silicates: silica tetrahedra are linked at corners to form continuous chains. They may be represented by a composition of $[SiO_3]^{2-}$. An example is diopside $CaMg[Si_2O_6]$, in which the "endless" chains are held together by Ca^{2+}- and Mg^{2+}-ions.



Double chain silicates: Two single silicate chains are linked by the corners forming double chains yielding $[Si_4O_{11}]^{6-}$ -ions. An example is glaucophane $Na_2Mg_3Al_2[(OH,F)|Si_4O_{11}]_2$.



Sheet silicates: are formed when silicate chains are linked at the corners to form continuous sheets with the chemical formula $[Si_2O_5]^{2-}$. Examples are the mica group, pyrophyllite $Al_2(OH)_2[Si_4O_{10}]$ or talc $Mg_3(OH)_2[Si_4O_{10}]$.



Framework silicates: are formed by silicate tetrahedra which are linked together with four neighboring tetrahedra in a three-dimensional framework in such a way, that the tetrahedra share one oxygen atom. This yield a ratio of (Si,Al):O=1:2, where silicon may be replaced by aluminum. Examples include the feldspars like orthoclase $K[AlSi_3O_8]$ as well as zeolites like natrolite $Na_2[Al_2Si_3O_{10}]\cdot 2H_2O$.