Dana's System of Mineralogy – Wikipedia Sept 2024

<https://en.wikipedia.org/wiki/Dana_classification_system>

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(Redirected from [Dana Classification System](https://en.wikipedia.org/w/index.php?title=Dana_Classification_System&redirect=no))

**Dana's classification**[[1]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-1)[[2]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-2) is a mineral classification developed by [James Dwight Dana](https://en.wikipedia.org/wiki/James_Dwight_Dana). It is based on the [chemical composition](https://en.wikipedia.org/wiki/Chemical_composition) and structure of minerals. It is mainly used in English-speaking countries, especially in the United States.

The mineral classification used by the International Mineralogical Association is the [Nickel-Strunz classification.](https://en.wikipedia.org/wiki/Nickel%E2%80%93Strunz_classification)[[3]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-3)[[4]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-4)

**History**

The classification of minerals was based on chemical composition by Dana in the fourth edition (1854, in two volumes) of his book System of Mineralogy.[[5]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-5)[[6]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-6) For the 20th century, this classification was completed thanks to scientific progress, particularly in the field of [crystallography](https://en.wikipedia.org/wiki/Crystallography). In 1941, [Karl Hugo Strunz](https://en.wikipedia.org/wiki/Karl_Hugo_Strunz) used it to construct his classification. Dana's original classification was further developed, and a new classification was published in 1997.[[7]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-7)

**Classification structure**

Minerals are arranged in a hierarchical system. Each mineral has a classification number, made up of four numbers separated by dots, enabling unambiguous identification even when minerals are known by several names (synonymy). The first number represents the mineral class. The second number represents the mineral type, in some cases taking into account its atomic structure. The third number represents a group of minerals of similar structure. The fourth number gives the unambiguous identification of the mineral.[[8]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-8)[[9]](https://en.wikipedia.org/wiki/Dana_classification_system#cite_note-9)

**Example**

[Kieserite group](https://en.wikipedia.org/wiki/Kieserite).

* 29. Acidic and normal hydrated sulfates
	+ 29.06.: acid and normal hydrated sulfates of the formula AXO4-x(H2O)
		- 29.06.02.: kieserite group (monohydrates)
			* 29.06.02.01.: kieserite MgSO4-(H2O), [space group](https://en.wikipedia.org/wiki/Space_group) C2/c
			* 29.06.02.02.: [szomolnokite](https://en.wikipedia.org/wiki/Szomolnokite) FeSO4-(H2O), space group *A2/a*
			* 29.06.02.03.: [szmikite](https://en.wikipedia.org/wiki/Manganese%28II%29_sulfate) MnSO4-(H2O), space group *A2/a*
			* 29.06.02.04.: povinite (Cu,Fe,Zn)SO4-(H2O), space group *P1*
			* 29.06.02.05.: gunningite (Zn,Mn)SO4-(H2O), space group *A2/a*
			* 29.06.02.06.: dwornikite (Ni,Fe)SO4-(H2O), space group C2/c
			* 29.06.02.07.: cobaltkieserite CoSO4-H2O, space group C2/c

**Mineral classes**

|  |  |
| --- | --- |
| Elements  | [Chemical element](https://en.wikipedia.org/wiki/Chemical_element)  |
| **Sulfides and sulfosalts**  | * [01. Sulfides](https://en.wikipedia.org/wiki/Sulfide)
* [02. Sulfosalts](https://en.wikipedia.org/wiki/Sulfosalt_mineral)
 |
| **Oxides and hydroxides**  | * 04. [Basic Oxides](https://en.wikipedia.org/wiki/Basic_oxide)
* 05. Oxides containing [uranium](https://en.wikipedia.org/wiki/Uranium) and [thorium](https://en.wikipedia.org/wiki/Thorium)
* 06. [Hydroxides](https://en.wikipedia.org/wiki/Hydroxide) and oxides containing [hydroxylation](https://en.wikipedia.org/wiki/Hydroxylation)
* 07. Multiple oxides
* 08. Multiple oxides containing [niobium](https://en.wikipedia.org/wiki/Niobium), [tantalum](https://en.wikipedia.org/wiki/Tantalum) and/or [titanium](https://en.wikipedia.org/wiki/Titanium)
 |
| **Halides**  | * [09. Halogenides](https://en.wikipedia.org/wiki/Halide)
* 10. Oxyhalides and hydroxyhalides[[10]](https://en.wikipedia.org/wiki/Dana_classification_system%22%20%5Cl%20%22cite_note-10)
* 11. Complex halides - alumino[fluorides](https://en.wikipedia.org/wiki/Fluoride)
* 12. Compound [halogenides](https://en.wikipedia.org/wiki/Halogenides)
 |
| **Carbonates, nitrates** **and borates**  | * 13. [Acid carbonates](https://en.wikipedia.org/wiki/Carbonate)
* 14. Non-hydrated normal carbonate
* 15. Normal hydrated carbonate
* 16a. Carbonate containing hydroxyl anion or halogen
* 16b. Carbonate containing hydroxyl anion or halogen
* 17. Compound carbonates
* 18. Simple [nitrate](https://en.wikipedia.org/wiki/Nitrate)
* 19. Nitrates containing hydroxyl anion or halogens
* 20. Compound nitrate
* 21. Non-hydrated and hydrated iodate
* 22. Iodates containing hydroxyl anion or [halogen](https://en.wikipedia.org/wiki/Halogen)
* 23. Compound [iodate](https://en.wikipedia.org/wiki/Iodate)
* 24. Non-hydrated borate
* 25. Non-hydrated borate containing hydroxyl anion or halogens
* 26. Hydrated borate containing hydroxyl anion or halogens
* 27. Compound [borate](https://en.wikipedia.org/wiki/Borate)
 |
| **Sulfates, chromates** **and molybdates**  | * 28. Acidic and normal non-hydrated [sulfates](https://en.wikipedia.org/wiki/Sulfate)
* 29. Acid and normal hydrated sulfates
* 30. Non-hydrated sulfates containing hydroxyl anion or halogens
* 31. Hydrated sulfates containing hydroxyl anion or halogens
* 32. Compound sulfates
* 33. [Selenates](https://en.wikipedia.org/wiki/Selenate) and [telluratess](https://en.wikipedia.org/wiki/Tellurate)
* 34. Selenites, tellurites and [sulfitess](https://en.wikipedia.org/wiki/Sulfite)
* 35. Non-hydrated [chromates](https://en.wikipedia.org/wiki/Chromate_and_dichromate)
* 36. Hydrated chromates
 |
| **Phosphates, arsenates** **and vanadates**  | * 37. Non-hydrated acid phosphates
* 38. Non-hydrated normal phosphates
* 39. Acid phosphates, hydrated
* 40. Normal phosphates, hydrated
* 41. Non-hydrated phosphates containing hydroxyl anion or halogens
* 42. Hydrated phosphates containing hydroxyl anion or halogens
* 43. Compound [phosphates](https://en.wikipedia.org/wiki/Phosphate)
* 44. [Antimoniates](https://en.wikipedia.org/wiki/Antimonite)
* 45. Acid and normal antimonites, arsenites, and phosphites
* 46. Basic or halogen-containing antimonites, arsenites, and phosphites
* 47. [Vanadium](https://en.wikipedia.org/wiki/Vanadium) oxysalts
* 48. [Molybdates](https://en.wikipedia.org/wiki/Molybdate) and [tungstates](https://en.wikipedia.org/wiki/Tungstate)
* 49. Basic and hydrated molybdates and tungstates
 |
| **Organic minerals**  | * 50. [Organic minerals](https://en.wikipedia.org/wiki/Organic_mineral)
 |
| **Silicates and germanates**  |  |
| * [Nesosilicates](https://en.wikipedia.org/wiki/Nesosilicates)
 | * 51. Nesosilicates containing only isolated [SiO4] tetrahedral groups
* 52. Groups of [SiO4] [tetrahedra](https://en.wikipedia.org/wiki/Tetrahedral_molecular_geometry) with O, OH, F, and H2O
* 53. Groups of [SiO4] tetrahedra with other anions or complex cations
* 54. Borosilicates and some beryllosilicates with [BO3].
 |
| * [Sorosilicates](https://en.wikipedia.org/wiki/Sorosilicates)
 | * 55. Groups Si2O7, generally without additional anion
* 56. Groups Si2O7 with O, OH, F, and H2O
* 57. Insular (Si3O10) and larger non-cyclic groups with Si3O10
* 58. Insular, mixed, isolated, and larger tetrahedral groups
 |
| * [Cyclosilicates](https://en.wikipedia.org/wiki/Cyclosilicates)
 | * 59. Three-membered rings [Si3O9].
* 60. Four-membered rings [Si4O12].
* 61. Six-membered rings [Si6O18].
* 62. Eight-membered rings [Si8O24].
* 63. Cyclosilicates with condensed rings
* 64. Rings with other anions and isolated [SiO4] groups
 |
| * [Inosilicates](https://en.wikipedia.org/wiki/Silicate_mineral)
 | * 65. Unbranched simple chains, periodicity W=1
* 66. Unbranched double chains, periodicity W=2
* 67. Unbranched chains, periodicity W > 2
* 68. Structures with variable chain widths
* 69. Chains branched to other chains or loops
* 70. Tubular or columnar structures
 |
| * [Phyllosilicates](https://en.wikipedia.org/wiki/Silicate_mineral)
 | * 71. Six-member ring layers
* 72. Infinite layers without six-member rings
* 73. Condensed tetrahedron layers
* 74. Modulated layers
 |
| * [Tectosilicates](https://en.wikipedia.org/wiki/Tectosilicates)
 | * 75. Tectosilicates
* 76. Aluminum and silicon networks
* 77. [Zeolite](https://en.wikipedia.org/wiki/Zeolite) group
 |
| * Unclassified silicates
 | * 78. Unclassified silicates
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