**Chemical Composition Justification Report**

This report provides justification for the chemical compositions assigned to various materials in the updated sub\_materials\_database\_sub\_materials\_database.csv file.

**Methodology**

The chemical compositions were determined based on the most common or pure forms of these materials as they are typically found or used in industry. For elements, a composition of 1.0 (100%) of that element was used. For compounds and minerals, the stoichiometric ratios of their constituent elements were calculated.

**Justifications**

1. **Mercury (Hg)**: Pure element, hence 100% Hg.
2. **Mica**: Based on the general formula KAl2(AlSi3O10)(F,OH)2. Proportions may vary slightly between different mica types.
3. **Silver (Ag)**: Pure element, hence 100% Ag.
4. **Molybdenum (Mo)**: Pure element, hence 100% Mo.
5. **Soda Ash (Na2CO3)**: Calculated based on the molecular formula.
6. **Gemstones**: Marked as "Varied" due to the wide range of compositions for different gemstones.
7. **Nickel (Ni)**: Pure element, hence 100% Ni.
8. **Stone**: Marked as "Varied" due to the diverse compositions of different types of stone.
9. **Asbestos**: Based on the composition of chrysotile, the most common form of asbestos.
10. **Niobium (Nb)**: Pure element, hence 100% Nb.
11. **Strontium (Sr)**: Pure element, hence 100% Sr.
12. **Barite (BaSO4)**: Calculated based on the molecular formula.
13. **Gold (Au)**: Pure element, hence 100% Au.
14. **Nitrogen (N)**: Pure element, hence 100% N.
15. **Sulfur (S)**: Pure element, hence 100% S.
16. **Graphite**: Pure carbon, hence 100% C.
17. **Talc**: Based on the ideal formula Mg3Si4O10(OH)2.
18. **Gypsum (CaSO4·2H2O)**: Calculated based on the molecular formula.
19. **Peat**: Marked as "Varied" due to its complex organic composition.
20. **Tantalum (Ta)**: Pure element, hence 100% Ta.
21. **Bismuth (Bi)**: Pure element, hence 100% Bi.
22. **Perlite**: Based on typical composition of volcanic glass.
23. **Tellurium (Te)**: Pure element, hence 100% Te.
24. **Boron (B)**: Pure element, hence 100% B.
25. **Platinum (Pt)**: Pure element, hence 100% Pt.
26. **Cadmium (Cd)**: Pure element, hence 100% Cd.
27. **Iodine (I)**: Pure element, hence 100% I.
28. **Tin (Sn)**: Pure element, hence 100% Sn.
29. **Cement**: Based on typical Portland cement composition.
30. **Pumice**: Based on typical volcanic glass composition.
31. **Rare Earths**: Marked as "Varied" due to the diverse compositions of different rare earth elements and their compounds.
32. **Vanadium (V)**: Pure element, hence 100% V.
33. **Clays**: Marked as "Varied" due to the diverse compositions of different clay minerals.
34. **Rhenium (Re)**: Pure element, hence 100% Re.
35. **Vermiculite**: Based on typical composition of vermiculite minerals.
36. **Lead (Pb)**: Pure element, hence 100% Pb.
37. **Wollastonite (CaSiO3)**: Calculated based on the molecular formula.
38. **Lime (CaO)**: Calculated based on the molecular formula.
39. **Salt (NaCl)**: Calculated based on the molecular formula.
40. **Diamond**: Pure carbon, hence 100% C.
41. **Lithium (Li)**: Pure element, hence 100% Li.
42. **Sand and Gravel**: Based on composition of pure silica (SiO2), which is the main component.
43. **Zeolites**: Based on a typical aluminosilicate zeolite composition.
44. **Diatomite**: Primarily composed of silica (SiO2) from diatom shells.
45. **Zinc (Zn)**: Pure element, hence 100% Zn.
46. **Manganese (Mn)**: Pure element, hence 100% Mn.
47. **Selenium (Se)**: Pure element, hence 100% Se.

**Note**

These compositions represent idealized or typical forms of these materials. In reality, natural occurrences or industrial products may contain impurities or variations in composition. For materials marked as "Varied," the composition can change significantly depending on the specific type or source of the material.