CLAIMS:

1. A piezoelectric thin film comprising:

crystalline AlN;

at least one first element by which Al in the crystalline AlN is partially replaced by a Group 3 element, Group 2 and 4 elements, Group 2 and 5 elements, Group 12 and 4 elements, or Group 12 and 5 elements; and

a second element with which the crystalline AlN is doped and which has an ionic radius smaller than an ionic radius of the first element and larger than an ionic radius of Al.

2. The piezoelectric thin film according to claim 1, wherein the first element is Sc, the piezoelectric thin film having a ratio of the number of Sc atoms to the total number of Al and Sc atoms of 0.03 to 0.50.

3. The piezoelectric thin film according to claim 1 or 2, wherein the second element exists as a trivalent cation.

4. The piezoelectric thin film according to any one of claims 1 to 3, wherein the second element is at least one element selected from W, Zr, Fe, Ta, Cr, Ti, and Ni.

5. The piezoelectric thin film according to any one of claims 1 to 4, which has a percentage ratio of the number of atoms of the second element to the total number of Al atoms and atoms of the first element of 0.01 at% to 1.00 at%.

6. A piezoelectric vibrator comprising:

a piezoelectric thin film; and

a pair of electrodes between which the piezoelectric thin film is disposed,

the piezoelectric thin film comprising:

crystalline AlN;

at least one first element by which Al in the crystalline AlN is partially replaced by a Group 3 element, Group 2 and 4 elements, Group 2 and 5 elements, Group 12 and 4 elements, or Group 12 and 5 elements; and

a second element with which the crystalline AlN is doped and which has an ionic radius smaller than an ionic radius of the first element and larger than an ionic radius of Al.