CLAIMS

1. An acoustic wave device comprising:

an electrode that excites an acoustic wave and is located on a substrate; and

a silicon oxide film that is located so as to cover the electrode and is doped with an element or molecule displacing O in a Si-O bond, wherein

the element or molecule is F, H, CH_3, CH_2, Cl, C, N, P, or S, and

the silicon oxide film doped with the element or molecule has a peak wave number of a Si-O bond stretching vibration larger than that of a silicon oxide film that is not doped with the element or molecule.

2. The acoustic wave device according to claim 1, wherein the element or molecule is F, H, CH_3, CH_2, or Cl.

3. The acoustic wave device according to claim 2, wherein the electrode is a comb-shaped electrode located on a piezoelectric substance.

4. The acoustic wave device according to claim 1, wherein the electrode includes a lower electrode and an upper electrode that are located so as to sandwich a piezoelectric substance, and

the silicon oxide film doped with the element or molecule is located in a region in which the lower electrode and the upper electrode face each other.

5. The acoustic wave device according to claim 1, wherein the silicon oxide film

doped with the element or molecule has a half-value width of an optical transverse wave mode of a Si-O bond stretching vibration smaller than that of a silicon oxide film that is not doped with the element or molecule.

6. The acoustic wave device according to claim 1, wherein the silicon oxide film doped with the element or molecule has a Young's modulus smaller than that of an undoped silicon oxide film.

7. The acoustic wave device according to claim 1, wherein the silicon oxide film doped with the element or molecule has an acoustic velocity slower than that of an undoped silicon oxide film.

8. The acoustic wave device according to claim 1, wherein the silicon oxide film is doped with two or more kinds of element of molecule.

9. The acoustic wave device according to claim 1, wherein the element or molecule is F.

10. The acoustic wave device according to claim 1, wherein the electrode is made of Cu, Au, Ag, W, Pt, Mo, Ni, or Cr.

11. The acoustic wave device according to claim 1, wherein the silicon oxide film doped with the element or molecule is formed by CVD.

12. The acoustic wave device according to claim 9, wherein

C_2F_6, CF_4, NF_3, F_2, HF, SF_6, ClF_3, BF_3, BrF_3, SF_4, SiF_4, NF_2Cl, $FSiH_2$, or F_3SiH is used as a source of the F.

13. The acoustic wave device according to claim 9, wherein the F content is not less than 2.1 atomic % and not more than 8.8 atomic %.

CLAIMS

1. An acoustic wave device comprising:

an electrode that excites an acoustic wave and is located on a substrate; and

a silicon oxide film that is located so as to cover the electrode and is doped with an element or molecule displacing O in a Si-O bond, wherein

the element or molecule is F, H, CH_3, CH_2, Cl, C, N, P, or S.

2. The acoustic wave device according to claim 1, wherein the element or molecule is F, H, CH_3, CH_2, or Cl.

3. The acoustic wave device according to claim 2, wherein the electrode is a comb-shaped electrode located on a piezoelectric substance.

4. The acoustic wave device according to claim 1, wherein the electrode is located so as to sandwich a piezoelectric substance.

5. The acoustic wave device according to any one of claims 1 through 4, wherein

the silicon oxide film doped with an element or molecule is doped with an element or molecule that makes a half-value width of an optical transverse wave mode of a Si-O bond stretching vibration smaller than that of a silicon oxide film that is not doped with the element or molecule.

6. The acoustic wave device according to any one of claims 1 through 5, wherein

the silicon oxide film doped with an element or molecule is doped with an element or molecule that makes a peak wave number of a Si-O bond stretching vibration larger than that of a silicon oxide film that is not doped with the element or molecule.

7. The acoustic wave device according to any one of claims 1 through 6, wherein the silicon oxide film doped with an element or molecule has a Young's modulus smaller than that of an undoped silicon oxide film.

8. The acoustic wave device according to any one of claims 1, and 3 through 7, wherein the silicon oxide film doped with an element or molecule has an acoustic velocity slower than that of an undoped silicon oxide film.

9. The acoustic wave device according to any one of claims 1, and 3 through 8, wherein the silicon oxide film doped with an element or molecule is doped with two or more kinds of element of molecule.

10. The acoustic wave device according to any one of claims 1 through 9, wherein the silicon oxide film doped with an element or molecule is doped with F.

11. The acoustic wave device according to any one of claims 1 through 10, wherein the electrode is made of Cu, Au, Ag, W, Pt, Mo, Ni, or Cr.

12. The acoustic wave device according to any one of claims 1 through 11, wherein the silicon oxide film doped with an element or molecule is formed by CVD.

13. The acoustic wave device according to claim 10, wherein C_2F_6, CF_4, NF_3, F_2, HF, SF_6, CLF_3, BF_3, BrF_3, SF_4, SiF_4, NF_2Cl, $FSiH_2$, or F_3SiH is used as a source of the F.