[0030]

<Synthesis Examples 2 to 9 and Synthesis Comparative Examples 1 to 5>

Using organic potassium compounds, organic sodium compounds and organic niobium compounds, which are the organic metal compounds shown in Table 2, these organic metal compounds were weighed so as to have the metal molar ratio shown in Table 2, and the content of the main solvent was changed as shown in Table 2. Liquid compositions of Synthesis Examples 2 to 9 and Synthesis Comparative Examples 1 to 5 were prepared in the same manner as in Synthesis Example 1 except for the above. In Synthesis Comparative Example 4, potassium alkoxide was used as the organic potassium compound. In addition, in Synthesis Comparative Example 5, sodium alkoxide was used as the organic sodium compound.

[0031]

<Example 1>

Next, for evaluation, a KNN film was formed on the substrate using the liquid composition obtained in Synthesis Example 1. A 4-inch Si substrate was used as the substrate. A 500 nm oxide film was formed on the Si substrate by thermal oxidation. 20 nm of Ti was deposited on the oxide film by a sputtering method, and a Pt lower electrode of (111) orientation having a thickness of 100 nm was formed thereon by a sputtering method. 0.5 ml of the liquid composition obtained in Synthesis Example 1 was dropped on the obtained substrate, spin coating was performed at 5000 rpm for 15 seconds, and the spin coated liquid was dried. Furthermore, pre-firing was performed on a hot plate at 300°C for 5 minutes. After that, firing was performed by RTA at 700°C in an oxygen atmosphere at a temperature increase rate of 50°C/sec and a holding time of 1 minute. Due to this, the KNN film of Example 1 was formed on the lower electrode.

[0034]

<Examples 2 to 13 and Comparative Examples 1 to 9>

Using the liquid compositions obtained in Synthesis Examples 2 to 9 and Synthesis Comparative Examples 1 to 5 and Synthesis Example 7 shown in Table 2, each of the liquid compositions was spin-coated in the same manner as in Example 1, dried, then the pre-firing temperature, the heating rate, the firing temperature, and the holding time were changed as shown in Table 3. Except for this, the KNN films of Examples 2 to 13 and Comparative Examples 1 to 9 were formed on the lower electrode in the same manner as in Example 1. In addition, in Comparative Example 2, precipitation occurred in the liquid, and in Comparative Example 3, it was not possible to uniformly coat the liquid composition, thus, it was not possible to form each film.

[0035]

<Comparative Test 1>

20 mg each of the liquid compositions synthesized in Synthesis Example 4 and Synthesis Comparative Example 1 was sampled on alumina plates and, using a thermogravimeter-differential thermal analyzer (TG-DTA) (manufactured by Mac Science, TG-DTA), these liquids were separately heated from room temperature to 800°C at a rate of 10°C/sec under atmospheric pressure and subjected to differential thermal analysis. The results of these measurements are shown in Fig. 1.

[0036]

<Evaluation Result 1>

As is clear from Fig. 1, as compared with the liquid composition of Synthesis Comparative Example 1, it was determined that the liquid composition of Synthesis Example 4 rapidly generated an exothermic reaction due to decomposition and oxidation at around 380°C. In addition to the carboxylic acid used in Synthesis Example 4, in a