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## 1. 概要(Summary)

It has been reported that material X can acheive extremely large dielectric constant over 1000 at room temperature. This asset could find usefull applications in memory devices. Therefore, thin films have been fabricated by means of reative stuttering from a X target. Even though XPS analysis revealed that all fabricated thin films did not match the theoretical stoichiometry, electrical evaluation has been pushed forwards and ***k***-value between 28 and 360 have been extracted.

## 2. 実験(Experimental)

A sputtering target made of material X and respecting its theoretical stoichiometry has been purchased and installed on the Auto Sputter-depo system available at the NIMS Nanofabrication Platform. Various thin films have been fabricated by reactive ion sputtering according to the split reported on Table 1. The $O_2$ concentration varied from 0 % up to 10 %. The other sputtering parameters were 50 Watt and 0.5 Torr. The power and pressure have been changed in order to investigate their impact on the thin film properties. Finally, co-sputtering of material X target with material B target has been investigated as well with the aim of raising the element B concentration within material X.

## 3. 結果と考察(Results and Discussion)

XPS analysis has been carried out on all samples and the concentration of each elements composing material X are reported on Table 1. The initial stoichiometry of material X is not respected for all samples. Oxygen is in excess for all samples while the other elements are in deficit. Furthermore, increasing the $O_2$ concentration during sputtering process did not result in an increase of the $O_2$ concentration in the deposited thin film. Another peculiar result is the difference in composition when $O_2$ is implemented or not during the fabrication process. To continue, results reported on Table 1 indicate also that the plasma power and the pressure does not alter the composition. Finally, as we might have expected, co-sputtering with material B enables a rise of the element B in the composition of material X towards the stoichiometric value. Unfortunately, another consequence is the reduction of element A and C. Even if the composition was not stoichiometric, the study has been pushed forwards. The capacitance measurement combined with the SEM analysis in order to obtain the optical thickness of the thin films allowed the extraction of the ***k***-values. They ranged from 28 for $O_2$=7.5 % up to 360 for $O_2$=0 %.

Tab. 1: Process parameters and atomic composition for all fabricated samples.

| | X target at 50 Watt and 0.5 Torr | Atomic % | | | | |
|---|---|---|---|---|---|---|
| | | O | A | B | C | |
| 1 | O2 : 0% | 70.2 | 2.2 | 6.3 | 21.3 | 100 |
| 2 | O2 : 2.5% | 68.3 | 4.3 | 14.3 | 13.2 | 100 |
| 3 | O2 : 5% | 67.1 | 4.1 | 14.7 | 14.1 | 100 |
| 4 | O2 : 7.5% | 66.3 | 4.6 | 14.8 | 14.3 | 100 |
| 5 | O2 : 10% | 66.9 | 4.6 | 14.4 | 14.2 | 100 |
| 6 | O2 : 10%, Power: 100W | 67.3 | 4.5 | 14.2 | 14.0 | 100 |
| 7 | O2 : 10%, with B target | 69.2 | 3.0 | 18.7 | 9.1 | 100 |
| 8 | O2 : 10%, High Pres | 68.0 | 4.0 | 14.3 | 13.7 | 100 |

## 4. その他・特記事項(Others)

なし

## 5. 論文・学会発表(Publication/Presentation)

なし

## 6. 関連特許(Patent)

なし