임베디드 커패시터로의 응용을 위해 상온에서 RF 스퍼터링법에 의한 증착된 bismuth magnesium niobate 다층 박막의 특성평가

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The characteristics of bismuth magnesium niobate multi layers deposited by sputtering at room temperature for appling to embedded capacitor

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Abstract : As micro-system move toward higher speed and miniaturization, requirements for embedding the passive components into printed circuit boards (PCBs) grow consistently. They should be fabricated in smaller size with maintaining and even improving the overall performance. Miniaturization potential steps from the replacement of surface-mount components and the subsequent reduction of the required wiring-board real estate. Among the embedded passive components, capacitors are most widely studied because they are the major components in terms of size and number. Embedding of passive components such as capacitors into polymer-based PCB is becoming an important strategy for electronics miniaturization, device reliability, and manufacturing cost reduction

Now days, the dielectric films deposited directly on the polymer substrate are also studied widely. The processing temperature below 200°C is required for polymer substrates. For a low temperature deposition, bismuth-based pyrochlore materials are known as promising candidate for capacitor

$B_2Mg_{2/3}Nb_{4/3}O_7$ (B_2MN) multi layers were deposited on $Pt/TiO_2/SiO_2/Si$ substrates by radio frequency magnetron sputtering system at room temperature. The physical and structural properties of them are investigated by SEM, AFM, TEM, XPS. The dielectric properties of MIM structured capacitors were evaluated by impedance analyzer (Agilent HP4194A). The leakage current characteristics of MIM structured capacitor were measured by semiconductor parameter analysis (Agilent HP4145B). 200 nm-thick B_2MN muti layer were deposited at room temperature had capacitance density about 1μF/cm^2 at 100kHz, dissipation factor of < 1% and dielectric constant of > 100 at 100kHz.

Key Words : Embedded capacitor, bismuth magnesium niobate multi layers, sputtering system, dielectrics