

## 박형 초음파 모터의 구동특성

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### Driving Characteristic of Thin-type Ultrasonic Motor

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**Abstract :** Newly designed structure of a thin ultrasonic rotary motor was proposed. Thin brass plate was used as a cross shaped vibrator and eight ceramic plates were attached on the upper and bottom sides of the brass plate as in Figure 1. The thin type ultrasonic motor has the structure adherent piezoelectric ceramic on the top and bottom surface of the thin elastic body. The direction of polarization is decided so as to occur the elliptical displacement in regular sequence at touch point A, B, C and D of stator contacted with rotor. By applying two electric fields which have 90 degree phase difference on the ceramics, each contact points make rotational displacements as in figure 2. Finite element analysis program ATILA was used to find the optimal size of the stator. As a result of the simulation, elliptical displacements of the tips were obtained at off-resonance frequencies. The maximum displacements of the contact tips were obtained at the length of 16[mm], width of 6[mm] and thickness of 0.4[mm]. Changes of the resonance frequencies were inversely proportional of the length of ceramic and proportional to the width of ceramic. Elliptical motions of the contact tips of the stator were consistently obtained at off resonance frequencies. From a prototype motor, speed of 600[rpm] was obtained at 20[Vrms].

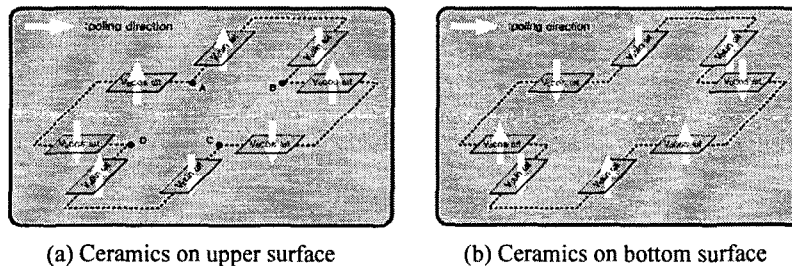


Fig. 1 Polarization and electric fields on ceramics

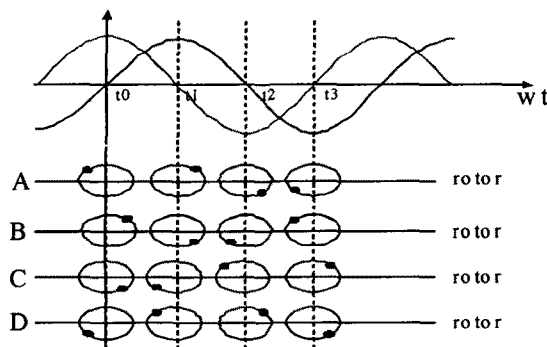


Fig. 2 Elliptical motions of the contact tips

**Key Words :** Ultrasonicmotor, Cross shaped stator, FEM, Elliptical motion