

十一、研究計畫中英文摘要：請就本計畫要點作一概述，並依本計畫性質自訂關鍵詞。

(二) 計畫英文摘要。(五百字以內)

In this project, we try to develop a portable Cymbal transducer array for transdermal drug delivery application.

Recently, ultrasound enhanced transdermal drug delivery technology (sonophoresis) has received increasing attention among the research fields of the drug delivery systems. Some drug doses such as antibiotic could be a metabolic burden to the liver. Management of diabetes such as insulin sometimes requires painful repetitive injections of insulin up to three times each day. To avoid these metabolic burden to the liver and continuous injections, noninvasive transdermal drug delivery has been considered. The ultrasound enhanced transdermal drug delivery can make the drug such as insulin in vivo easy to traverse the stratum corneum and subsequently to the reach capillary vessels to be absorbed.

This research presents the development of a cymbal-type transducer for Transdermal drug delivery applications. Because the piezoelectric transducers using conventional PZT ceramics cannot provide the desired deformation, the Cymbal transducer is developed to increase amplification of displacement by converting radial displacement into large longitudinal displacement and improve the performance of the transdermal drug delivery system(TDDS). A portable Cymbal transducer array for transdermal drug delivery will be developed in this project, and this research project is schedule for three years.

In the First year (2008/8~2009/7), the design theorem of the Cymbal transducers will be studied. Physical factors (such as structure, cavity depths, cap thickness, materials, and dimension) that affects the properties (such as displacement, resonance frequency, driving power, electromechanical coupling efficiency) of the transducer

device will be discussed by using the simulation software of finite element methods. After that a Cymbal transducer with resonance frequency of 20kHz is developed and fabricated. The impedance matching of the transducer is also a research issue in this year.

In the second year (2009/8~2010/7), the design theorem of the transducers array will be studied. Array made up of Cymbal transducers with different combinations ( two by two or three by three ) that affects the array properties (such as directivity and width of main lobe) will be discussed by using the simulation software. After that a Cymbal transducer array with operation frequency of 20kHz is developed and fabricated. The development of automatic testing system for the transducer array is also an important research issue during the year.

In the third year(2010/8~2011/7), A array control system consisting beamforming module, output power modulation module, power amplifier module, signal manipulation module and interface of communication and display will be developed .

Key words : Cymbal Transducer, Transducer Array, Sonophoresis, Transdermal Drug Delivery System, Control System