There are many types of waves propagating along the medium, in terms of wave forms, these could be Longitudinal Wave, Transverse Wave, Surface Wave, Flexural Wave and Lamb Wave, etc., wherein longitudinal wave means the medium particle has vibration in the same direction as the propagation direction of the wave, since this wave is propagating through intermittent dense and sparse way, it is also called P-wave. If we divide the wave by frequency, the normal sound wave frequency that can be head by human ear is in the range of 16Hz~20kHz, therefore, wave with frequency above 20kHz is called Ultrasonic Wave, it has widespread use, apart from the familiar application in medical field, it is also is widely accepted in industrial production, for example, non-destructive test, ultrasonic cleaning, ultrasonic welding and ultrasonic cutting, etc.

The commonly used ultrasonic wave can be divided into two main categories, such as Low-Intensity Ultrasonics and High-Intensity Ultrasonics. The former means when the object receives ultrasonic energy, there is only some physical change, no permanent change on the material nature will be seen, it is commonly used in medical test for human body, sonar tracking or non-destructive test. The latter means that object will generate heat or cavitation or even chemical change due to ultrasonic energy, it is widely used in the industry, for example, Ultrasonic Machining, Ultrasonic Welding, emulsifying, etc.

Regarding the use of ultrasonic energy in vibration cutting technologies, Sato apply ultrasonic vibration to cutting blade, cutting blade is used to impact the processed object, this method can achieve cutting function of micro breaking to fragile materials such as ceramic and glass, etc. People gradually find its application in semiconductor processes in recent years, Chen uses chemical process to add resin-activated materials to the bare copper of leadframe, then uses ultrasonic wave to remove oxide on the bare copper, it eliminates a necessary tedious process to plate gold first on the leadframe, it is found to have very good adhesion to the chip. Hsu found that in semiconductor or optoelectronic process of removing polyimide film, adding of ultrasonic vibration in the immersion tank can shorten its removal time. John in his processing of substrate, he uses ultrasonic wave to vibrate fluid container surface, the ultrasonic includes vertical and horizontal emitting devices to achieve the design of alternating in space. 口清文

design etchant using ultrasonic vibration, the etchant is used to remove residue on the porous area of the substrate, it also increases the etching rate of the etchant. 富田寬, in the process of cleaning semiconductor substrate, he adds ultrasonic vibration to the spraying end of cleaning agent, it allows cleaning agent to reach both the front side and back side of the substrate, better cleaning result can thus be obtained.

In the past literature of ultrasonic research, Ultrasonic Receiver is commonly used for the single point measurement of ultrasonic wave, research methods of whole field is very few. However, photoelasticity method can reduce this drawback, it is a stress analysis method of whole field, non-contact and in-time monitoring, it has been applied in the study of dynamic stress since 1928. Therefore, in this study project, we are going to install photoelasticity system, rectangular planar board with notch will be investigated on the stress distribution after the incidence of ultrasonic wave, it will then be compared to the simulation and analysis result obtained from ANSYS analysis software which is based on finite element method, we hope that the research result can be helpful for the application of ultrasonic processing to the manufacturing process of Light Emitting Diode, LED.

In optoelectronic semiconductor processes, GaN LED is very promising product, it includes blue and green LED, it can be applied in auto, electrical appliance, electrical instrument illumination, display and communication, etc. However, one of the key technology in developing GaN LED is on the high melting point of the substrate used (about 1600 ℃), therefore, single crystal substrate of high quality is difficult to be produced by ingot pulling. Therefore, GaN crystal currently is grown as low defect concentration epitaxial film on different substrates by epitaxial technology. The major technology currently is the growth of GaN material on Sapphire substrate, however, for LED device made on sapphire, crack propagation can easily reach the inside of the device during the dicing process, thus, the dicing yield is very low. Therefore, it is very important task to improve substrate dicing technology in LED optoelectronic industry. Some research units once proposed new way of substrate dicing, it is different than the conventional way of diamond blade dicing or laser dicing, instead, ultrasonic which does not consume materials is used for the dicing, first, epitaxial substrate is etched for a

notch to be used as the crack propagation guide, then ultrasonic wave energy is used to break the substrate, this not only reduce the cost but increase the yield. But there is very few literature to be referred to for this technology. Therefore, experimental results are urgently required as a basis to put this new technology into LED processes.