

Experiment study on magneto-acoustic imaging by using liquid metal

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Abstract— The low signal level of magneto-acoustic signals limits the image quality of magneto-acoustic imaging. The feasibility of using liquid metal for image enhancement to magneto-acoustic imaging is observed. The result shows the liquid metal could be detected and imaged.

I. INTRODUCTION

Magneto-acoustic (MA) imaging is a novel non-invasive approach to detect electrical characteristics of biological tissue [1][2]. Electrical and magnetic fields are applied on the tissue, acoustic vibration is generated due to the Hall Effect. The acoustic signal collected by transducer outside the tissue could reflect electric conductivity distribution of the tissue. Thus, it can provide a meaningful diagnosis reference for cancer and other diseases related to electrical properties. Because the magneto-acoustic signal is weak, the imaging quality is limited.

II. METHODS

In this paper, liquid metal GaInSn (99.999%) is used in magneto-acoustic imaging as image intensifier [3]. The melting point of GaInSn is about 12°C, which is lower than the human body temperature.

In order to study the feasibility of liquid metal for magneto acoustic imaging, we designed an experimental equipment, showed as Figure 1(a). The liquid metal is put into the pre-cut tank of the agar phantom. The current is imposed to the liquid metal by a pair of copper electrodes. The agar phantom is fixed to an acrylic plate, which can be driven by motor to rotate. The excitation is a pulse with 1100 V peak-to-peak. The measured signal is amplified by 60dB. The signal is collected by the transducer and the scanning angle step is 1.8°.

III. RESULTS

Figure 1 (b) shows the experiment phantom. The reconstructed image is showed in Figure 1(c). The image showed similar shape of the phantom with the liquid metal. The distribution of the image is accord with the metal liquid.

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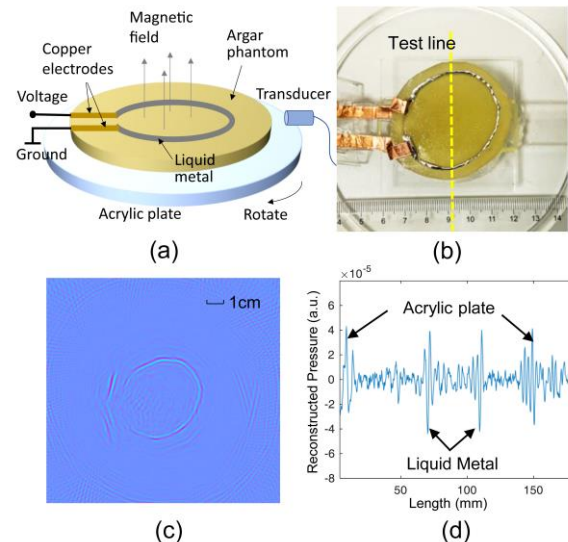


Figure 1. Experiment result of the magneto-acoustic imaging by using liquid metal.

(a) is the experiment scheme (b) is the photo of the phantom (c) is the reconstructed image (d) is the reconstructed acoustic source distribution along the test line.

IV. CONCLUSION

We investigated the magneto-acoustic imaging with liquid metal. The experimental results clearly show the shape of liquid metal. This study verified the feasibility of liquid metal for magneto-acoustic image enhancement. It is of great significance to improve the SNR of magneto-acoustic signals and image quality.

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