

Novel High Performance Planar Mesh Type MicroElectroMagnetic Sensors

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Design, fabrication and employment of a novel planar type electromagnetic sensors has been carried out. The outcomes have been successfully applied in many applications such as the inspection of printed circuit boards, estimation of near-surface material properties, electroplated materials, and saxophone reed inspection. The extension of the use of the sensors for the inspection of dairy products is under investigation.

Fig. shows the configuration of planar electromagnetic. The sensor consists of two coils: an exciting coil and a sensing coil in which the sensing coil is placed on top of the exciting coil. The exciting coil carrying a high frequency current will induce an electromagnetic field in the testing system. The induced field in the testing system will modify the generated field and the resultant field will be detected by the pick-up coil placed above the exciting coil. The structural configuration of the sensor is shown in Fig.. The exciting coil and the sensing coil is separated by a polyimide film of 50 μm thickness. In order to improve the directivity of flux flow a magnetic plate of NiZn is placed on top of the sensing coil. The size of the sensor depends on the number of pitches used in that. The optimum pitch size depends on the application. The size used in this application is 27 mm X 27 mm with a pitch size of 3.25 mm. Fig. shows the actual picture of the experiment set-up.

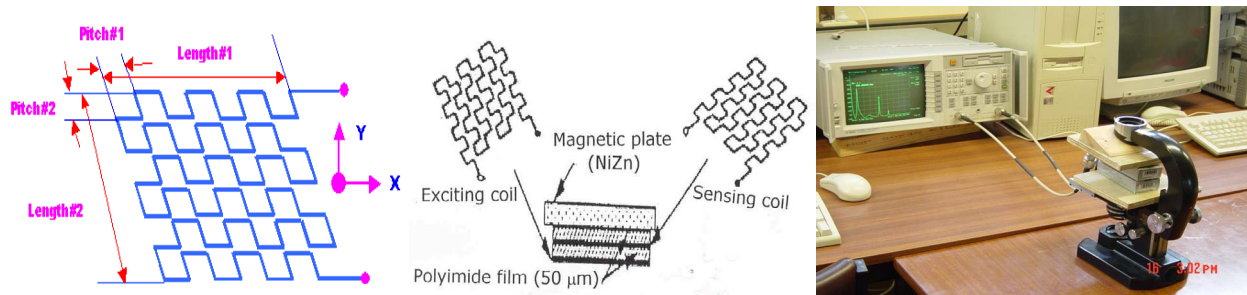


Fig. Sensor configuration, structure and experimental set-up

References

- [1] YAMADA,S., FUJIKI,H., IWAHARA,M., MUKHOPADHYAY, S.C., and FAWSON,F.P., “Investigation of printed wiring board testing by using planar coil type ECT probe”, *IEEE Transactions on Magnetics*, vol. 33, no. 5, Sep. 1997, pp. 3376-3378.
- [2] MUKHOPADHYAY,S.C., YAMADA,S., and IWAHARA, M., “Evaluation of near- surface material properties using planar mesh type coils with post-processing from neural network model”, *International journal on Electromagnetic Nondestructive Evaluation (VI)*, 2002, IOS Press, Vol. 23, pp 181-188.
- [3] MUKHOPADHYAY,S.C., “Quality inspection of electroplated materials using planar type micro-magnetic sensors with post processing from neural network model”, *IEE Proceedings – Science, Measurement and Technology*, vol. 149, no. 4, pp. 165-171, July 2002.
- [4] MUKHOPADHYAY,S.C., YAMADA,S., and IWAHARA,M., “Experimental Determination of Optimum Coil Pitch for a Planar Mesh Type Micro-magnetic Sensor”, *IEEE Transactions on Magnetics*, Vol. 38. NO. 5, pp 3380-3382, Sep. 2002.
- [5] MUKHOPADHYAY, S.C., “A Novel Planar Mesh Type Micro-electromagnetic Sensor: Part I - Model Formulation”, *IEEE Sensors journal*, Vol. 4, No. 3, June 2004, pp 301-307.
- [6] MUKHOPADHYAY, S.C., “A Novel Planar Mesh Type Micro-electromagnetic Sensor: Part II – Estimation of System Properties”, *IEEE Sensors journal*, Vol. 4, No. 3, June 2004, pp 308-312.