DC05

Microwave Characterization of nanostructures

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In recent years there has been a wide interest in the production and analysis of nanostructures of different types for their RF and microwave properties: thin films, exchange bias films, nanogranular materials, structured nanogranular films, nanorings and very recently magnetic tunnel junction devices with nanometer point contacts and nanopillars.

In this contribution we will present a summary of the calibration techniques and the evaluation of the uncertainties obtained under different characterization techniques.

Experimental setup: The heart of the microwave testing system at INRIM consists in a Vector Network Analyzer which operates in the 40 MHz-65 GHz range. Several circuits can be usedfor testing: a coplanar waveguide (CPW) with 2.4mm end launch connectors, a probing station with K connectors which can be used up to 18-40 GHz and a V connector universal test fixture (UTF) up to 50 GHz. A SOLT calibration of the cables allows to obtain a flat response of the CPW structure (-2 dB) up to 30 GHz, an even more accurate calibration can be obtained using the GSG probes and the proper calibration substrate or the UTF and relevant calibration kit. The systems (CPW, probes, UTF) can be positioned within Helmholtz Coils (45 kA/m) or within the gap of an electromagnet with adjustable gap and different pole caps, allowing the application of the magnetic field in different directions for different structures: i.e. in the case of the CPW one can achieve up to 0.5 Tm along the axis or 1.5 T transversally to the axis.

Using such a setups several high sensitivity measurements were possible, among which:

- Nanogranular materials with oblique columnar structure and field induced FMR above 20 GHz
- Comparison between optical modes measured with Brollouin scattering experiments and FMR in PY nanorings (n=0 quantized spin wave mode) - Ferrite nanopowders

REFERENCES

[1] K. Jang, Y. Kim, and R. Kruse, phys. stat. sol. (a), **1**, 1 (1999).

[2] P. Lee, T. Lim, and M. Hong (eds.), Computer Simulation of Materials at Atomic Level (Wiley-VCH, Berlin, 2000), p. 890.

Plenary01

Overview of nanotechnology and next generation memories in Korea

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Back in July 2001, the Government made an ambitious ten-year nanotechnology initiative to nurture NT, which was an initial step to keep up with the global trend in favor of the next-generation technology. The initiative was revised to cope with technical trends late 2005 and breaks down into two stages until 2015 that the Government is going to pour 4.86 trillion won ($1= ~1000 won) into the scheduled projects. The Government had aimed to enter the world top 5 nations in this field by 2010. However, our vision has already come true as evidenced by the research output measured by patents and publications for last 5 years. We believe that we could get into the world top 3 nations by 2015. I will briefly present several on-going national nanotechnology programs and future nanotechnology plan in Korea.

The 21st century is characterized by an information society. To fulfill the final path to this society, every computing system should be flexible, intelligent, mobile, programmable and real-time. Accordingly, computing performance and memory capacity of transistors in the computing system should be more than 1000 fold enhanced with ultra-low power dissipation as compared with present ones. Last September, Samsung announced the development of 32 giga bit NAND Flash memory. This development trend suggests that tera bit Flash memory can be developed by year 2011 if all the necessary technologies are progressively developed in time. Unfortunately, we face even now big technological difficulties for further scaling - down of Flash memory due to the unavailability of appropriate tunnel barriers and so on. I will discuss the generic road-blocks of proposed emerging memories including MRAM.