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Measurement of Active Power Using an Optical Fiber Grating

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There is increasing motivation to develop sensors and actuators to manage domestic power consumption. This paper demonstrates an optical fiber sensor using a superstructure fiber grating (SFG) to measure active power consumption. The sensor head is based on SFG encapsulated in a polymer-half-field metal cylinder embedded a magnetic material at measure point. The operating mechanism is that the sensor can be attracted by the induced magnetic force created by the solenoid along one radial direction only, and responds to an axial force on the magnetic rod attached to the round plate, creating an axial attraction on the SFG [1-3]. Fig. 1 shows the structure of the sensor. The peak values of the load current and load voltage are measured through the peak detector circuit consisted by diode and capacitor. The sensing mechanism in this device is based on the radial magnetic force that is induced by the solenoid for both of load voltage and load current. The magnetic force in the solenoid is proportional to the load active power if both magnetic fields are the same. The magnetic force in the solenoid is attracted by the magnetic rod on the end of the SFG and cause the change of the effective refraction index. The amount of the wavelength shift is proportional to the radial magnetic force. Since the magnetic field strength in the solenoid is proportion to the active power of load, the magnitude of the peak value of active power of load can also be determined. The experimental setup is shown in Fig. 2. A plot of the measured wavelength is a function of the active power shown in Fig.3, which displays linearity between the wavelength and the active power.

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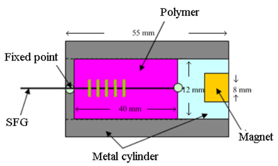

Fig. 1. The structure of the sensor.

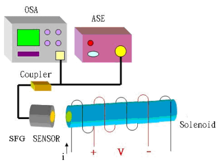

Fig. 2. The experimental setup.

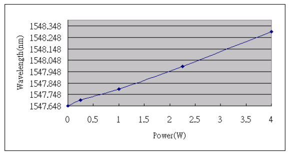

Fig. 3. Measured wavelength is function of the active power.

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Magnetic Properties and Spin Dynamics of a Hexanuclear Manganese Ring and its 3D Network

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We report a proton nuclear magnetic resonance (NMR) and relaxation measurements on a hexanuclear antiferromagnetic (AFM) spin ring and its 3 dimensional network system, in brief {Mn6} and {Mn6} - network, respectively. The study has been aimed at exploring the influence of phonon on the spin dynamics, in particular on the scaling behavior of ^{1}H spin-lattice relaxation rate $1/T_1$ commonly observed in AFM molecular rings [1]. The magnetic properties of both systems were observed to be almost identical and characterized by AFM coupling constants $J_1/k_B \approx -4.0$ K, between the nearest neighbors, and $J_2/k_B \approx -1.0$ K, between the next nearest neighbors. Heat capacity has been observed to be different in two systems, whereby the molar heat capacity in {Mn6} - network is smaller and increased by less rapidly with T as expected from the more rigid structure of the network system. The ^{1}H $1/T_1$ shows a broad peak at low T in both systems similar to the common observation in AFM rings or clusters [1], but the peak positions of two samples are found to be totally different. The peak position of the ^{1}H $1/T_1$ in {Mn6} - network shifts to higher T, which agrees qualitatively with the slower increase of the heat capacity with T in the network system.

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