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The MRF-Stimulated nano excitation in geo-rock gold containing (G-1&G-2) crystals of Bundelkhand (U.P.), India

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KEYWORDS

MRF excitation, SSNTDS, Magneto-conductivity, Hall coefficient.

A B S T R A C T

The gold bearing minerals samples from Hansra village, Lalitpur district (U.P.), of Bundelkand region India, is found to develop oscillatory Hall potentials under radio-frequency perturbations. The insulating nature of these samples develops electrical conductivity and transverse magneto-potential recorded under radio-frequency and various physical parameters had been computed. When they are employed with the six probe Hall geometry the rf-signal ranging between 1-7 MHz being fed at 45^0 with x and y axis, magnetic field H between (0-10kG) being in z-direction. The differential conductance (di/dv-v) curves along with second derivative (d^2i/dv^2-v) have been computed which yield the peak structures matching with nano materials and thus confirming super lattice structures of geo-solids. It is motivated that geo-rocks (G-1 & G-2) behave as synthetic metals and semiconducting characteristics had been expected under MRF- switching. The rf- processing of rooks as been used in SSNTD, photo-sensor detectors, optoelectronic component and one superior alternate to the resent microwave energy interaction approaches for advance material with improved micro-structures.

Introduction

The gold contenting peridotitc/pyroxnite rocks of area (Swarup et al., 2002) belonging to Archaean-proterozoic age (Sharma and Rahman, 1996). These rocks are possessing the poly-metallic structure with cu, Ag, Co, Ni, Au, Pb, etc, (Mondal, and Zainuddin, 1996; Prakash et al., 1975). It had been employed for the proposed Hall study in these materials. These crystals are highly deformed older gneisses-green stone components and made in long many years (2600my). The electromagnetic wave having a frequency of range, 0.3–300GHz, when interacted with materials influenced by the properties of material (Ghosh et al., 2001). The parameters government the electrical conductivity in geo-rocks and minerals are difficult to be isolated for their due to trace impurities, grain boundaries, presence of relative physical characteristics. In the want of a physical model distinguishing the electrical sensitivities water, thermal conductivity, elasticity, temperature, etc. The magneto radio-frequency excitation seems to influence the electrical conduction process very deeply. The MRF- stimulated electrical conduction processes in geo-rocks reveals the signatures of resonant tunnelling (RT) through quantum well grown up by MBE, etc. The spatial as well as temporal MRF activation on geo- rock crystal had also been recorded.

Materials and Methods

The samples were prepared by cutting the geo-rocks crystals in standard rectangular geometry and were employed in six-electrode Hall probe. The Hall potential records for the gold rocks crystal G-1 & G-2 were obtained at room temperature using magneto-dynamic spectrometer. The V-1 Curve Showed in Fig. 1 & 2.

The radio frequency dependent first differential conductance (di/dv-v) curves along with second derivative (d^2i/dv^2-v) characteristics had been shown in Figure 1–4. The various physical parameters such as Hall coefficient R_H, Hall mobility (μ), plasma frequency (ω_p), free space wavelength λ_p had been computed as shown in table 1 & 2.

Result and Discussion

The electrical as well magneto conductivity of Gold containing minerals are varying with magnetic field as well frequency. The Non-linear current-voltage (V-I) characteristics (Fig. 1 & 2) under RF-excitation show opto-electronic sensitivity of Gold minerals G-1 &G-2. The V-I Curve can be transformed in to (σ-T) curve (Gebhardt and Nimtz, 1985).

The differential conductance (di/dv-v) curves shows in Figure 3 & 4 along with second derivative (d^2i/dv^2-v) curves shows Figure 4 & 5 had been plotted computing data from I-V characteristic. When the current is increased the edge and bulk current cannot remain completely independent of each other. Experimentally, the differential resistances are much larger beyond breakdown. This seems to be due the induced coupling edge and bulk parameters to be separated by magnetic field.

Table.1 The MRF-generated parameters for G-1

f(MHz)	$R_H \times 10^{-15}$	$\omega_p \times 10^{11}$	λ_p (cm)	$\mu \times 10^6$
1.0	9.42	0.48	3.88	0.32
2.0	14.1	0.39	4.77	0.47
3.0	5.76	0.62	3.04	0.58
4.0	0.42	2.29	0.82	0.42
5.0	0.09	5.01	0.38	0.47
5.5	0.07	5.57	0.34	0.47

5.85	0.58	1.94	0.97	0.58
6.0	0.04	7.34	0.26	0.74

Table.2 The MRF-generated parameters for G-2

f(MHz)	**$R_H \times 10^{-15}$**	**$\omega_p \times 10^{11}$**	**λ_p (cm)**	**$\mu \times 10^6$**
1.0	1.57	1.183	1.59	0.89
2.0	0.94	1.534	1.23	0.54
3.0	0.52	2.064	0.91	0.89
3.2	0.98	1.783	1.60	2.25
3.35	1.05	1.448	1.30	1.81
4.0	0.43	2.269	0.83	2.71
5.0	0.09	5.009	0.38	2.20
6.0	0.20	3.322	0.57	2.87
7.0	0.10	12.37	0.15	2.64

Fig.1 The MRF-stimulated V–I characteristics of geo-rock (G-1) at frequency (f) = 5 MHz

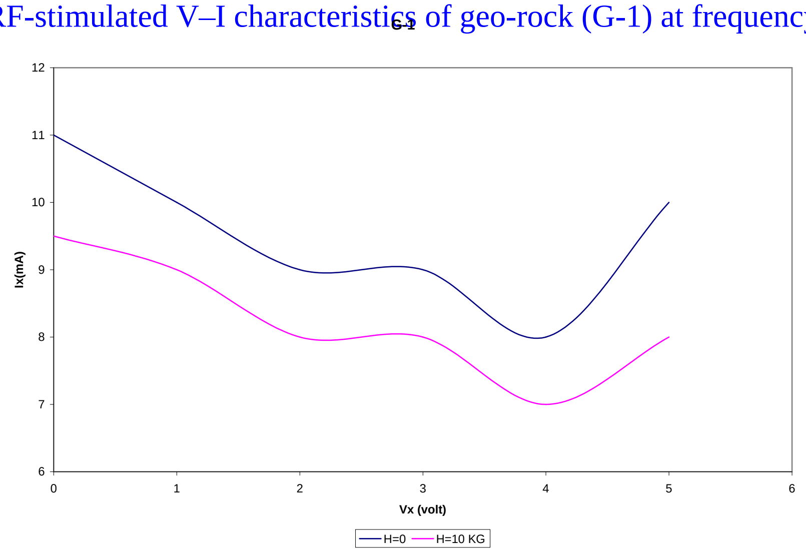


Fig.2 The MRF-stimulated V–I characteristics of geo-rock (G-2) at frequency (f) = 5 MHz

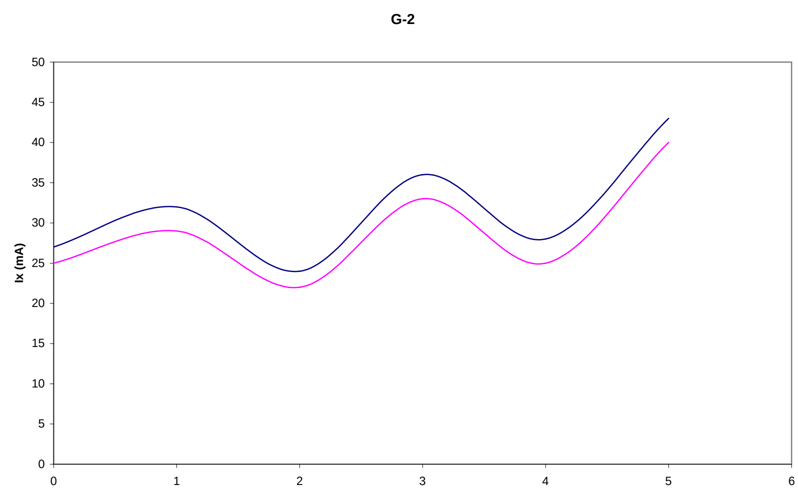


Fig.3 The differential conductance characteristics of geo-rock (G-1) with and without magnetic field

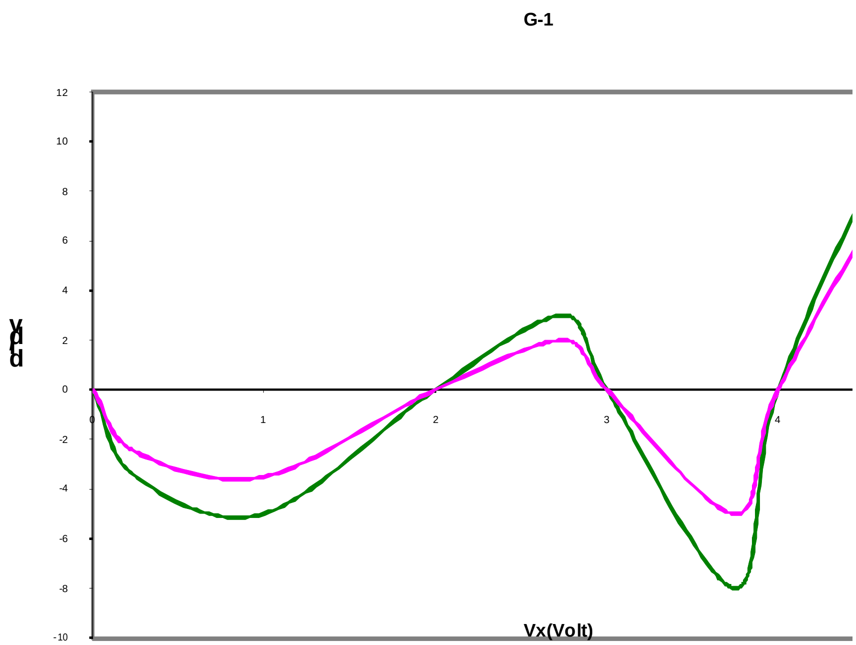


Fig.4 The differential conductance characteristics of geo-rock (G-2) with and without magnetic field

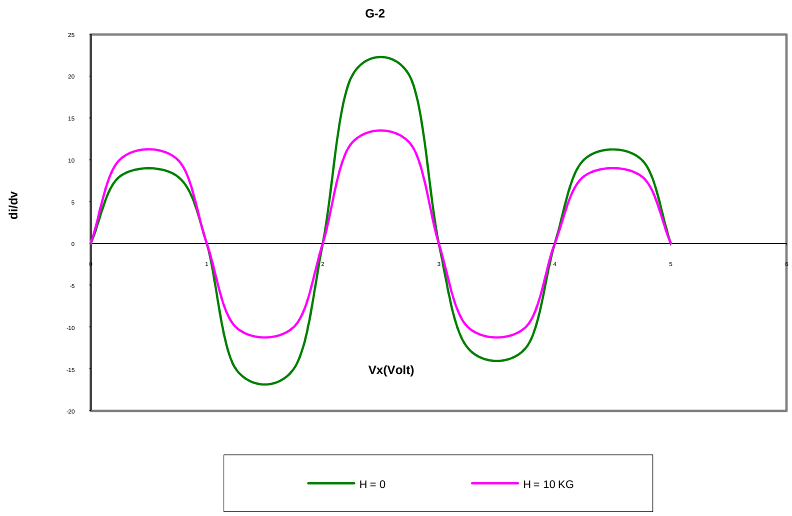


Fig.5 The second derivative conductance characteristics of ge0-rock (G-1) with and without magnetic field

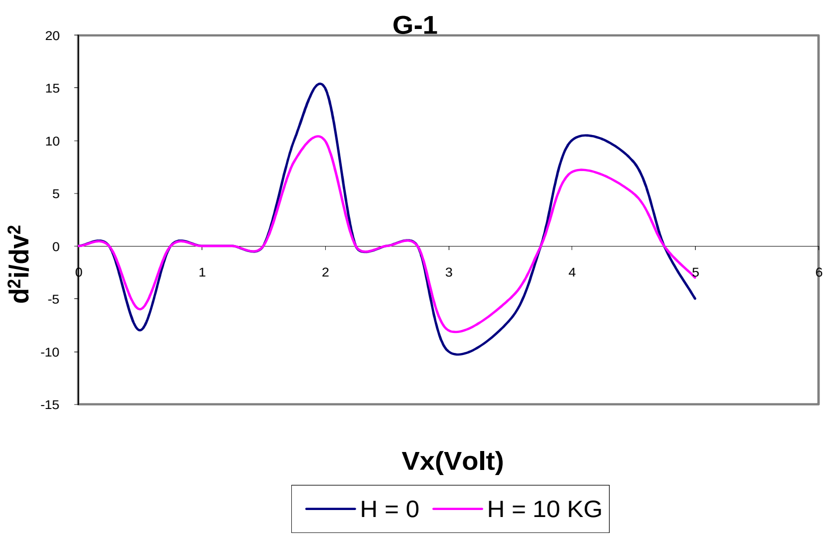
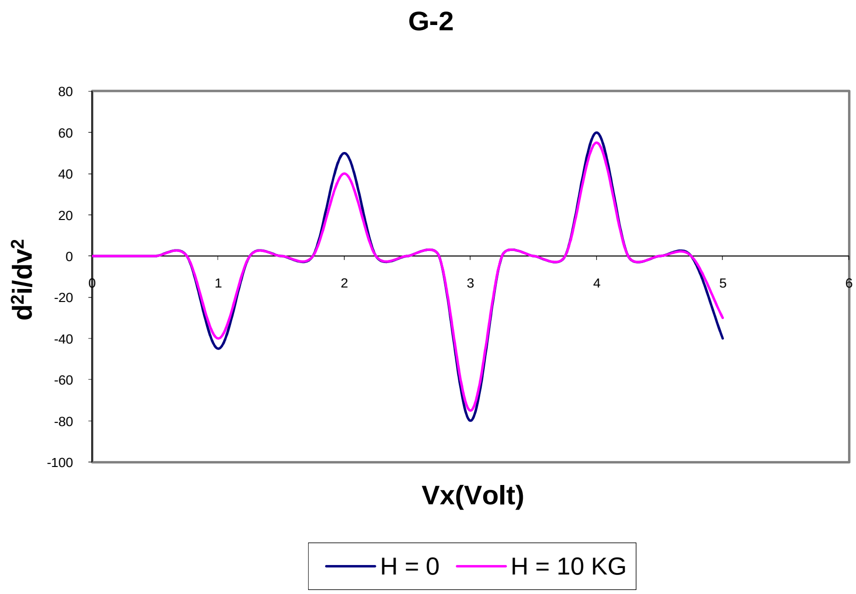


Fig.6 The second derivative conductance characteristics of geo-rock **(G-2)** with and without magnetic field


G-2
80
60
40
20
0
-20
-40
-60
-80
-100
0
1
2
3
4
5
6
d²i/dv²
Vx(Volt)
H = 0
H = 10 KG

The differential tunnelling (Tsuei and Kirtley, 2000) conductance di/dv of the various junction in geo-rocks (G-1&2) being proportion to the local density of state (LDOS), whose spatial distribution could be derived as a function of sample bias voltage V under MRF-perturbation. The second derivative (d^2i/dv^2-v) yields peak structure confirming the transition of crystalline structure in super lattices configuration (Fig. 6). The MRF – perturbation seem to transform the geo-crystal as synthetic semiconductors.

The MRF- generated parameters as Hall coefficient R_H~10^{-15}, Plasma frequency ω_p ~10^{11}, free space wave length λ_p <20 and mobility $\mu \sim 10^6$ such all parameter variable with frequency and all values match with semiconductor at room temperature.

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