

Scale theory and Metal-Insulator Transition in metallic n-type InP semiconductor at very low temperatures with high magnetic field

A. El kaaouachi¹, R. Abdia¹, A. Nafidi¹, G. Biskupski²

¹Research Group in Condensed Matter Physics, Physics department, University Ibn Zohr, Faculty of Sciences, B.P 8106, Hay Dakhla, 80000 Agadir, Morocco.

²Laboratoire de Spectroscopie Hertzienne (CNRS), équipe des semiconducteurs, Université des Sciences et Technique de Lille I, F 59655 Villeneuve d'Ascq Cédex, France.

Abstract:

The Metal-Insulator Transition (MIT) induced by a magnetic field, in metallic and compensated n-type InP semiconductor has been analysed using a scale theory. The experiments were carried out at low temperature in the range 4.2 -0.066 K and in magnetic field up 11 T. Physical explanation to the temperature dependence of the conductivity are given in both sides of the MIT using a competition between different characteristic scale lengths like correlation length, interaction length, localization length, and hopping length.

References

- [1] A. Kawabata Solid. State. Commun. **34** 431. (1980)
- [2] E. Abrahams, P. W. Anderson, D. C. Lucciardello, and T. V. Ramakrishnan, Phys. Rev. Lett. **42** 673 (1979).
- [3] N. F. Mott, Phil. Mag. **26** 1015 (1972)
- [4] M. Kaveh and N. F. Mott, J. Phys C: Solid State Phys **14** L183-L190 (1981)
- [5] B. L. Altshuler and A. G. Aronov, JEPT Lett **37** 410 (1983)
- [6] Y. Isawa, K. Hoshino and H. Fukuyama, J. Phys. Soc. Japan **51** (10) 3262 (1982)
- [7] I. P. Zvyagin, Phys. Stat. Sol (B) **120** 503 (1983)
- [8] B I Shklovskii and A L Efros Electronic Properties of Doped Semiconductors Springer-Verlag North- Holland Berlin. (1984)
- [9] R Abdia, A El kaaouachi, A Nafidi and J Himine, Physica B. Condens. Matter **373** 96 (2006)
- [10] A. El kaaouachi M R Abdia, A. Nafidi and H Sahsah Physica E **32** 419. (2006)
- [11] A El kaaouachi, A Nafidi and G Biskupski Physica. Status. Solidi (b). **vol. 241**, N°1, 155. (2004)
- [12] A El kaaouachi, A Nafidi and G Biskupski Semiconductors Sciences and Technology **18** 69 (2003)
- [13] A El kaaouachi, A Nafidi and G Biskupski Physica B. Condens. Matter **304** 377. (2001)
- [14] A El kaaouachi, A Moudden and G Biskupski Physica B. Condens. Matter. **Vol 226**, N°:4 378.(1999)
- [15] G Biskupski, A. El kaaouachi and A. Briggs, J. Phys. Condens. Matter **3** 8417 (1991)

Email: kaaouachi21@yahoo.fr