Report

Brief Report on Graphene-Like Material

B. G. Sidharth[1]
G.P. Birla Observatory & Astronomical Research Centre
B.M. Birla Science Centre, Adarsh Nagar, Hyderabad - 500 063 (India)

Abstract

In this brief report, I note that noncommutative geometry may be at play in experimentally observed properties for graphene-like material.

Keywords: Graphene-like, noncommutative geometry, lattice structure.

In recent papers [1, 2, 3, 4] it was pointed out by the author that graphene has some important properties which have not been properly appreciated. This was on the basis of the author's theory that these properties are due to the noncommutative space behaviour of any two dimensional, that is one atom thick crystal with a lattice structure. These crystals have been likened to a chessboard, there being the intra lattice gaps which are independent of the chemical composition of the crystal. Because of this, there is a noncommutative geometry at play. That is if x and y are the space coordinates then,

$$[x, y] \approx 0(l^2) \neq 0,$$

where l is the inner lattice length. As shown in the above references the experimentally observed properties for graphene like the fractional Quantum Hall Effect and the minimum conductivity

$$\sigma = 4\frac{e^2}{\hbar} \tag{0.1}$$

can be immediately theoretically deduced using this property of noncommutative spacetime. It was also pointed out that equations like (0.1) show that there is a generation of a free electric current. Moreover, it was stressed that what is important here is the geometry – not the chemistry, that is all this would be true for any 2-D crystal.
The object of this report is to note that indeed such a circumstance has now been reported [5] in the case of Stanene, which unlike graphene has tin atoms. So Stanene has the magic properties of graphene and this confirms the above mentioned result.

References

[1] Sidharth, B.G. (2015). *Int.J. Mod.Phys.E.* 2015.

[2] Sidharth, B.G. (2014). *Int.J. Mod.Phys.E.* Vol.23, No., 2014, 1491001ff.

[3] Sidharth, B.G. (2014). *Int.J.Mod.Phys.E.* Vol.23, No.05, 2014.

[4] Sidharth, B.G. (2015). *Int.J.Th.Phys.* Vol.54, No.7, pp.2382-2385.

[5] *Nature* Vol.524, No.18, 2015.

[1]Correspondence: E-mail: iiamisbgs@yahoo.co.in