

## Letter to Editor

# On the History of Nanoscience and Nanotechnology

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The story of the very beginning of “nanosized material” is the idea from the mathematical explanations of melting reported in 1910 when Lindemann F. A. published the article "The calculation of molecular vibration frequencies" in “*Physik. Z.* 11: 609–612” (Lindemann, 1910) describing the principles that we called the behaviour of nanosized materials. His role was a simple measure of thermally driven disorder in atoms or molecules which has the same principle of nanosized material combinations. His model became the principle to derive and explain the melting model I used for nanosized materials in my researches (Omar, 2012).

The beginning of nanoscience can strongly go back to 1973, when three researchers published articles on "Topological Phase Transitions and Topological Phases of Matter" (Kosterlitz & Thouless, 1973). In 2016, they were awarded a Nobel Prize in Physics as one half to David J. Thouless who was 83 years old, and the other half to F. Duncan M. Haldan (63) and J. Michael Kosterlitz (73). Their work helped to explain why some materials have unexpected electrical properties such as superconductivity and to pave the way for quantum computers. At the time, they didn't know that they just made the idea for a new form of matter latter called a “nano size” range of matter, as “nanotechnology” for manufacturing and “nanoscience” for the properties.

There is another interesting story for me: in 1982, when I was in my first year as a PhD student in Bath, England, I used gas transport technique to grow  $\text{CuZnGe}_3\text{P}_5$  in my research work but it didn't give me a stoichiometric combination for the compound, instead a band of needled shaped wires were grown on the top of crystalline state as shown in Figure 1, and they were expected to belong to Cu.

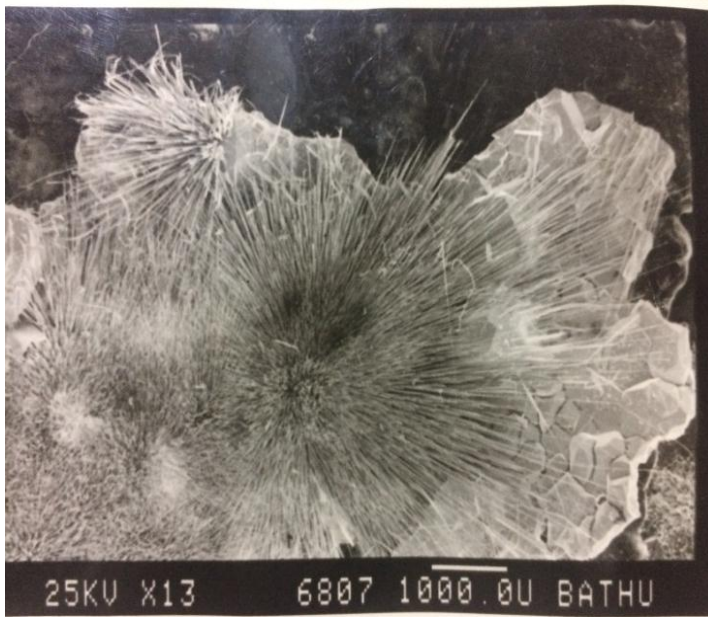


Figure 1: Photograph taken by M. S. Omar in 1982 (unpublished)



Figure 2: The royal society of chemistry 2015

The results at the time seemed to be rubbish, but during the last four years of my work on thermodynamic properties of nanowires (Omar, 1985) I found that, I might have grown nanowires four decades ago in comparison to reported images as in the sample in Figure 2.

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