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The Time of Engineers In Graphene Research

Editorial

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Since its first synthesis one decade ago, graphene has been gaining a lot of interest among the academia and industry, not only due to its amazing properties, but also because it was the first two dimensional material ever isolated, and that could open the door to many others. In such context, an unprecedented campaign started to point graphene as the clue material for next generation devices, and journalists often created a magical aura referring to it as the wonder and the miracle material. All together let graphene rapidly raise tones of public and private funding, as well as the interest of many journals, a combination that dragged a countless amount of scientists. During some years, working with graphene was a synonym of money and high impact factor papers and, as any other hot topic, it ensured many citations.

But ten years later the panorama seems to be quite different. Graphene fever has calmed and, for many chemists and materials scientists, it is not a priority hot topic anymore. Graphene has generated many supporters but also detractors, and many voices demand a less euphoric and more realistic point of view. After a decade working with graphene, most of its intrinsic properties have been well described and characterized, and future findings seem to be more linked to engineered applications. Therefore, many devotee followers suddenly shifted their attention to other fields, almost always to newer two dimensional materials. One of the reasons might be that many journals have explicitly announced that they won't be publishing such a large amount of papers in graphene research anymore. So, was all together a clever campaign to overvalue graphene, or is it actually the key to next generation devices?

At the moment the only companies making real profit with graphene are those that commercialize the raw material. Big corporations like IBM, Samsung and Sandisk are taking care of the entire graphene production chains and, unlike some years ago, now their engineers have in their hands a well described and powerful tool to improve the capabilities of traditional devices. But before mass production and commercialization, all lab prototypes reported must go under exhaustive testing. The companies first need to optimize the fabrication processes, define device reliability tests, introduce failure analyses, perform statistical variability studies, and develop lifetime predictions. Therefore, engineers are now going to play a vital role for the future of graphene research, which from a realistic point of view, looks very exciting: BCC Research released a new edition to their "Graphene: Technologies, Applications and Markets" report, in which they forecast that the global graphene product market will reach \$195 million in 2018, and this will grow quickly to \$1.3 billion by 2023 at an annual growth rate of 47.1%. Engineers have always finished the work started by chemists and materials scientists, using the materials they discovered to create new devices for our society, and I am sure in the next years graphene engineers are going to enjoy a lot with this powerful toy. The best of graphene is coming.