With exotic discovery of graphene, the focus of researchers brings initiatives in field of atom-thick two-dimensional (2D) materials having exceptional and extraordinary properties. In year 2010, Prof. Andre Geim and Prof. Konstantin Novoselov from the University of Manchester, UK were jointly awarded the Nobel Prize in Physics for their ground-breaking experiments on the two-dimensional material graphene. Data elucidated from Scopus (www.scopus.com) indicates that since 2010, on graphene 77,221 documents have been published from over 120 countries. Number of documents reported on graphene increased from 3,748 to 16,378 since 2010 to 2016. The graph depicts significant increase in the graphene research after 2010 (Fig. 1a).

The most active countries are China, United States, South Korea, India, Japan, Germany, United Kingdom, Singapore, Iran and Italy ranked with respect to the documents reported during six years (Fig. 1b). Since 2010, 81.7% of the documents are reported as a research article and 51.5% of research is carried out in the field of material science (Fig. 2).

The dimensionality of material plays an important role in tuning different properties, depending on the arrangement of atoms in 0, 1, 2 and 3-dimensional crystal structure. 2D materials have atomically-thick geometry with intrinsic flexibility and can easily be integrated with various substrates because of absence of surface dangling bonds. The 2D crystals having unusual physical phenomenon tender a wide scope of new materials for potential applications such as super thin nanomaterials capable with a high degree of anisotropy and chemical functionality.
In ongoing research, graphene has a vast amount of interest in growing world, which is, a monolayer of carbon atoms tightly packed in 2D honeycomb lattice with sp² bonded carbon atoms with its unusual properties give rise to different applications. With exceptional properties, there are some shortcoming as pristine graphene [1-16]. Stacking of graphene layer are problematic due to π−π and hydrophobic interactions. Pristine graphene is zero band gap material and is insoluble in polar solvents and are hydrophobic naturally with poor catalytic performance. The interactions between graphene and smaller molecules are weak. Because of these above-mentioned limitations, possible application of graphene is restricted. The chemical modification and electronic structure modification cannot be controlled. So chemical functionalization is an operative methodology to alter the structure and many properties of graphene like chemical, mechanical and photosensitive properties and done by number of methods filtration, solvent supported techniques, layer by layer assembly. Due to zero band gap of graphene, its application in field of sensors and semiconductors like transistors and band gap tuning of graphene is carried out by many methods like doping and covalent and non-covalent functionalization of graphene.

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With best regards
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