**Chemical and Structural Engineering of Two-Dimensional Materials**

 Hyunseob Lim\*

*Department of Chemistry, Chonnam National University, 44919, Korea*

Research interest into two dimensional (2D) materials other than graphene has recently become intense, first because of the basic desire of researchers to explore new worlds in two dimensions from the point of view of materials research, and second to avoid the drawbacks of graphene for certain applications. Compared to metallic property of graphene, hexagonal boron nitride (h-BN) and transition metal dichalcogenides (TMDs) have insulating and semiconducting properties, respectively. Therefore, these 2D materials can be widely used for various applications regarding to their unique properties.

Herein, I present the recent research results working on graphene, h-BN and two-dimensional covalent organic frameworks (2D-COFs), as well as their heterostructures. The presentation includes the improved synthetic methods of 2D materials and their electrical and optical applications. Especially, the unique electronic structure of graphene nanowrinkles (GNW), and the novel method for periodically aligned hydroxyl groups on graphene will be introduced. Also, recent approaches to synthesize 2D-COFs will be discussed.



Figure 1. Graphene Nanowrinkle (mechanical engineering) and Periodic Graphene Hydroxide (chemical engineering)

**Reference**

[1] Kim, S.; Park, C.; Lee, M.; Song, I.; Kim, J.; Jung, J.; Kim, Y.; **Lim, H.**\*; Choi, H. C.\*, *Adv. Funct. Mater.* **2017**, *accepted.*

[2] Kim, G.; Kim, M.; Hong, S.; Hyun, C; Ma, K. Y.; Shin, H. S.\*; **Lim, H.**\*, *ACS Nano* **2016**, *10*, 11156.

[3] Jang, A.-R.; Hong, S.; Hyun, C.; Yoon, S. I.; Kim, K.; Jeong, H. Y.; Park, S. O.; Wong, K.; Kwak, S. K.; Park, N.; Yu, K.; Choi, E.; **Lim, H.**\*; Shin, H. S.\*, *Nano Lett.* **2016**, *16*, 3360.

[4] **Lim, H.**;. Jung, J.; Ruoff, R. S.; Kim, Y., *Nat. Commun.* **2015**, *6*, 8601.