IBS Center for Multidimensional Carbon Materials

Tuesday Colloquium

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Multifunctional Nanoarchitectures for CO2 Capture and Conversion

Tuesday, JUNE 28
2 PM

Bldg. 101
Seminar room on the 1st floor

The increasing trend of CO2 emission into the atmosphere along with its environmental effects positioned the CO2 capture technologies as an integral part of today`s energy industry. However, current capture technologies remain to be inefficient, resulting in costly energy penalties. In this regard, porous polymers have emerged as a promising candidate for CO2 capture and received considerable attention due to their distinctive gas sorption properties and physicochemical stabilities.1 In spite of their unique and distinctive properties, however, predicting and controlling their packing mode is highly challenging due to their amorphous nature; however, it is a highly critical parameter to get high surface area and pore volume which play crucial role for their application in CO2 capture and separation. In order to overcome these limitations, we have developed a new strategy to introduce local-order into amorphous nanoporous polymers using shape-persistent supramolecular structures as molecular building blocks in order to synthesize next generation porous polymers which enable us to control and tune their textural properties.2 Importantly, we have also shown that intrinsic properties of supramolecular building blocks can be transferred into the resulting porous frameworks. In addition to the proposed CO2 capture and sequestration technology aiming to store CO2 in underground reservoirs, the usage of CO2 as a C1 building block for making high-value added products is an alternative approach not only to tackle with increasing CO2 emissions but also create incentives for research efforts in this area. In this sense, we have introduced “two in a one approach” for simultaneous capture and conversion of CO2 to industrially important products with high selectivity respect to both reactants and products.3 This presentation will focus on how the structures and properties of porous materials can be tuned by rational designs transforming them into a multifunctional nanoarchitectures for CO2 capture and conversion.

[1] Buyukcakir O., Je S. H., Park J., Patel H. A., Jung Y., Yavuz C. T., Coskun A. Chem. Eur. J., 2015, 21, 15320-15327.
[2] Buyukcakir O., Seo Y., Coskun A. Chem. Mater., 2015, 27, 4149-4155.
[3] Buyukcakir O., Je S. H., Choi D. S., Talapaneni S. N., Seo Y., Jung Y., Polychronopoulou K., Coskun, A. Chem. Commun., 2016, 52, 934-937.

You are cordially invited to attend!