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Editorial

New materials are playing an increasingly more critical role in modern technology development. Very often, a new material itself becomes an enabling technology. What was not possible before can now frequently be done with a new material coupled with existing or improved process know-how. The situation in adsorption is no different. I seldom leave a meeting or a discussion without hearing someone making the comment, "if only we could have an adsorbent for...". Could it be that we know more about process technologies such as PSA, simulated moving bed, etc., than we do about adsorbents? Maybe or maybe not, but what is clear is that the field of adsorption can certainly benefit from more research on the material front. From that perspective, it seems appropriate to devote an issue of *Adsorption* to the topic of new adsorbents and ion exchange materials.

There are eight contributions in this issue covering a wide range of subjects. These papers reflect some interesting research directions. Zeolites have been used extensively for adsorption and catalytic applications. Adsorption study on zeolites, however, appears to be lagging behind the fast pace of new zeolite synthesis. Research on the adsorption behavior of relatively new zeolites such as the $AlPO_4$ series, and techniques such as monolayer dispersion of salts for enhancing zeolite adsorption selectivity, are useful information for those involved in separations and catalysis.

Using an external field to control the adsorption characteristics of adsorbents is a more recent development. Those interested are encouraged to read the theoretical analysis by Vaidya et al., on the use of externally controlled liquid crystals. The external-field concept is an advancement over previous attempts such as magnetic stabilization of adsorbents, which mainly addressed issues related to the fluid mechanics of adsorption processes. It is too early to judge whether or not the concept can be applied to large scale operations. The approach, however, does have the potential for facilitating the recovery of adsorbed molecules, and could have a very positive impact on process economics.

In many cases, adsorption technology is superior to other separation techniques in terms of energy utilization. Adsorption researchers need to work hard to maintain this competitive edge, since the energy efficiency for other techniques has been rising in recent years. An example is the incorporation of heat pumps into various separation processes such as distillation, extraction, and crystallization, resulting in major energy reduction. Applying the heat pump concept to adsorption is made difficult by the inherently poor heat transfer property of solid adsorbents. Nevertheless, this does not seem to be a problem that cannot be overcome, as Pino et al., demonstrated in their work that higher specific power could be derived from composite adsorbents.

In the era of environmental awareness, activated carbon apparently is (and should be) a focus of adsorption research, as reflected by the quantity of carbon-related papers in this issue. The use of activated carbon in various forms such as powder, particles, membrane, etc., for waste treatments is an important component of our environmental technology. It is also encouraging to see that a significant amount of effort has been made to take advantage of the synergistic benefit of deriving usable activated carbon from waste materials.

There are plenty of separation challenges around us (bio, chemical, petroleum, environmental, just to name a few). Many of the challenges could become opportunities for adsorption research and adsorption technology. Whether we can meet the challenges and capture the opportunities rely in no small part on the development of novel adsorbent materials. Hopefully, the publication of this special issue can promote more research in this important area.

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