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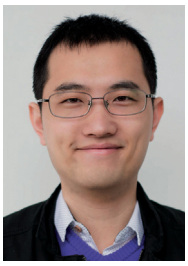
From Packed "Sandwich" to "Russian Doll": Assembly by Charge-Transfer Interactions in Cucurbit[10]uril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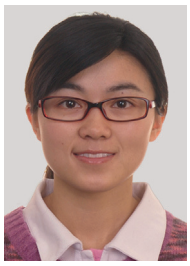
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Invited for the cover of this issue is the group of Lyle Isaacs and Simin Liu at the University of Maryland and Wuhan University of Science and Technology. The image depicts two packed "sandwiches" and one supramolecular "Russian doll" that are assembled by host–guest and charge-transfer interactions. Read the full text of the article at 10.1002/chem.201604149.

What is the most significant result of this study?

Besides the simultaneous encapsulation of multiple guests by cucurbit[10]uril (CB[10]), the most interesting finding is that tetracationic cyclophane, blue box, can be included inside CB[10], and a CB[10] protected pseudorotaxane, "Russian doll", can be assembled by threading a guest through the cavities of both blue box and CB[10]. Blue box is a known building block pioneered by the Nobel Prize winner Prof. J. F. Stoddart to create mechanically interlocked molecular machines. Encapsulation of a host in a bigger host and the assembly of "Russian doll" expand the use of CB[10] as a fascinating new building block to create new molecular machines and devices.

Did you expect a very different outcome? If so, what was your initial guess?

When the results showed blue box can enter the cavity of CB[10], we expected that the encapsulation of blue box within CB[10] would tremendously change its binding ability towards electron-rich aromatic molecules. Although aromatic guests still can be included by the complex of CB[10]–blue box, the binding ability of blue box with or without CB[10] are quite similar. This is probably because the binding is dynamic, and the encapsulation of blue box did not change its relatively rigid structure.

What other topics are you working on at the moment?

Currently, both the Isaacs and Liu groups are interested in cucurbit[*n*]uril (CB[*n*]) chemistry. The Isaacs group focuses on the synthesis of new CB[*n*] molecular containers, such as acyclic CB[*n*] derivatives, and the potential application of these hosts on drug delivery system. Besides exploring the stabilization of unstable chemical species, such as iminium cations by CB[*n*] in water, the Liu group mainly focuses on the molecular recognition and assembly involved CB[10]—especially, encapsulation of macrocyclic host within CB[10] and the synergistic effect of the complex.