Impact of Linker Structure on Chloride-binding by Two-point Halogen Bond Donors

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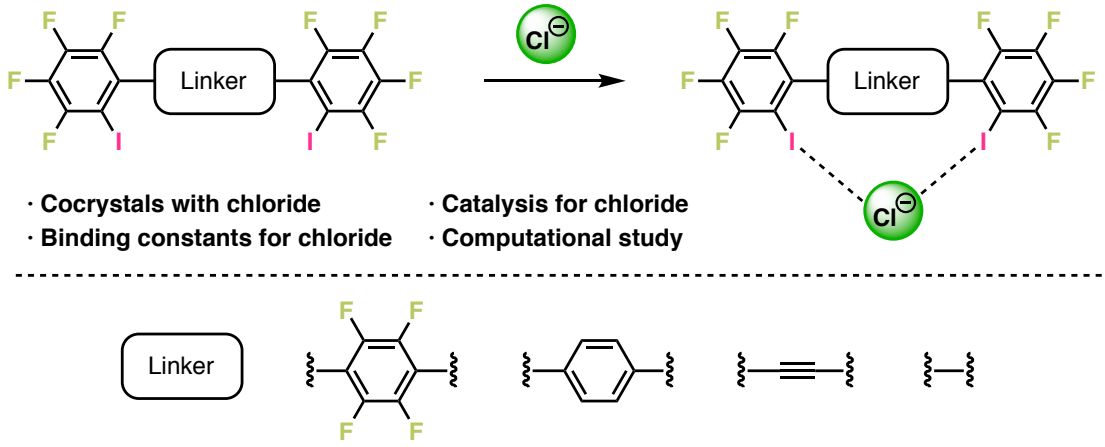
Keywords: Halogen Bonds; Perfluoroiodoarenes; Cocrystals; Catalysis; Mannich reaction

Halogen bond has been utilized in crystal engineering and currently applied in molecular recognition and organocatalysis.[1,2,3] Two- and multi-point halogen bond donors have been designed to enhance their halogen bond donor ability compared to one-point donors. In this study, we systematically investigated the effect of linker structure possessed in two-point halogen bond donors, with a focus on perfluoroiodobenzene structures. Halogen bond donors with a different linker were evaluated in binding constants K (M^{-1}) for chloride and reaction yields (%) in Mukaiyama-Mannich-type reaction of isoquinoline through chloride-binding. The two-point halogen bond donor possessing a tetrafluorophenylene linker exhibited the highest activity. Chloride-binding modes were proposed based on Job's plots and co-crystal structures with chloride. Computational study was performed to elucidate the effect of linker on the activity. Finally, the utility of the tetrafluorophenylene-linked two-point halogen bond donor was established in the Mukaiyam-Mannich-type reaction involving various isoquinolines, chloroformates, and silyl enol ethers.



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