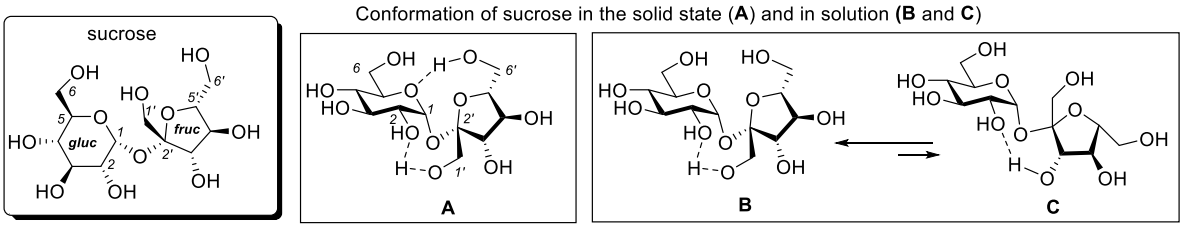
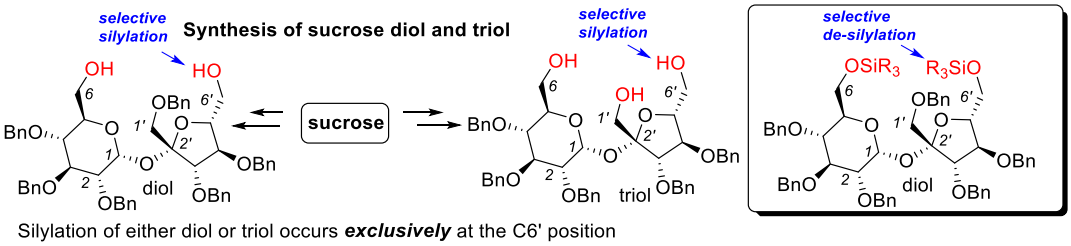
Chemistry of sucrose. Towards sucrose-based macrocyclic receptors

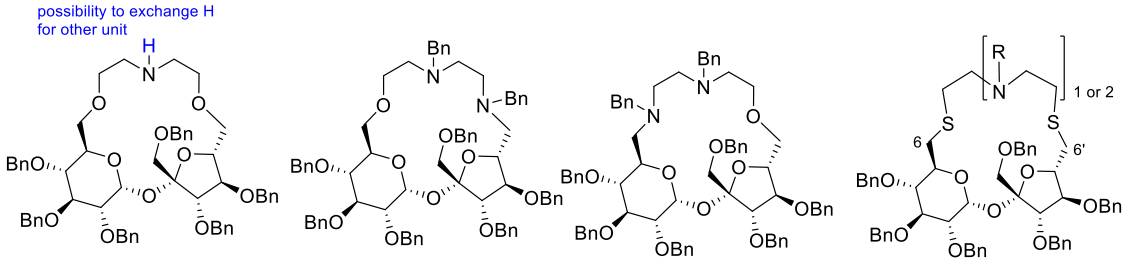
Sucrose, built of D-glucopyranose (***gluc***) and D-fructofuranose (***fruc***) units connected *via* their anomeric positions, is undoubtedly the most common di-saccharide occurring in Nature. Since it has no anomeric hydroxyl groups (both are blocked) it is classified as non-reducing sugar.



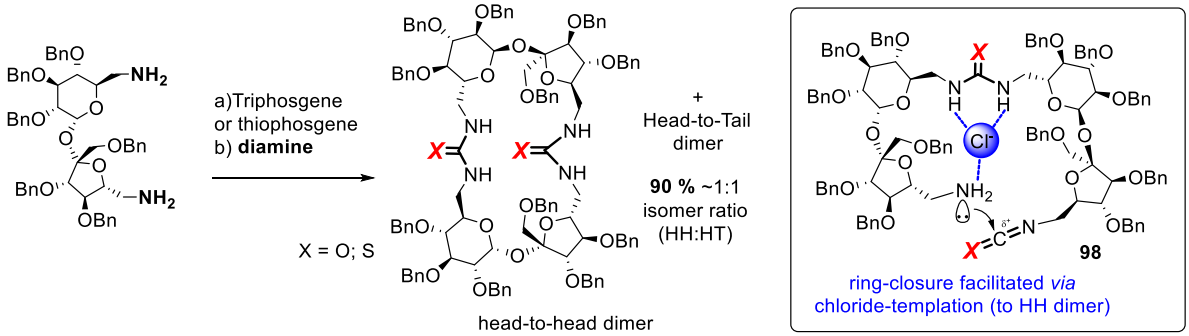
In our group we use specifically protected sucrose as a chiral platform for the synthesis of macrocyclic receptors able to differentiate the molecules of enantiomeric guests. We elaborated a convenient route to sucrose diol and sucrose triol which were used further for synthesis. We took advantage from the fact that reaction of either diol or triol with equimolar amounts of silyl chlorides occurs exclusively at the C6'-position (fructose part). **No** formation of other monosilylated product was noted. Reaction with an excess of silyl chlorides afforded protection also at the glucose part (C6); this di-silylated intermediate can be selectively de-protected at the 'fructose end'.



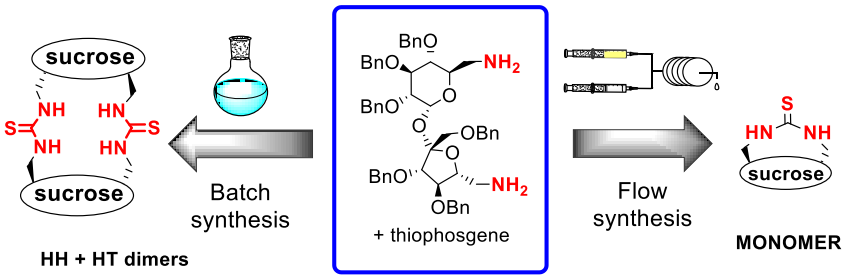
An easy access to selectively blocked sucrose derivatives allowed us to prepare a number of crown and aza-crown ethers (examples below).



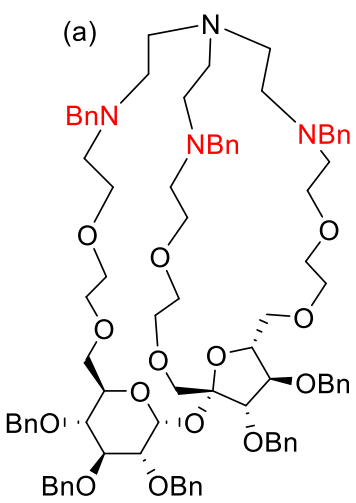
Although usually cyclization occurs in relatively low yields this process can be facilitated by a templation effect. For example, reaction of sucrose di-amine with triphosgene or thiophosgene afforded appropriate dimers in very high total yields (up to 90%) which resulted from the presence of chloride anion acting as a template.



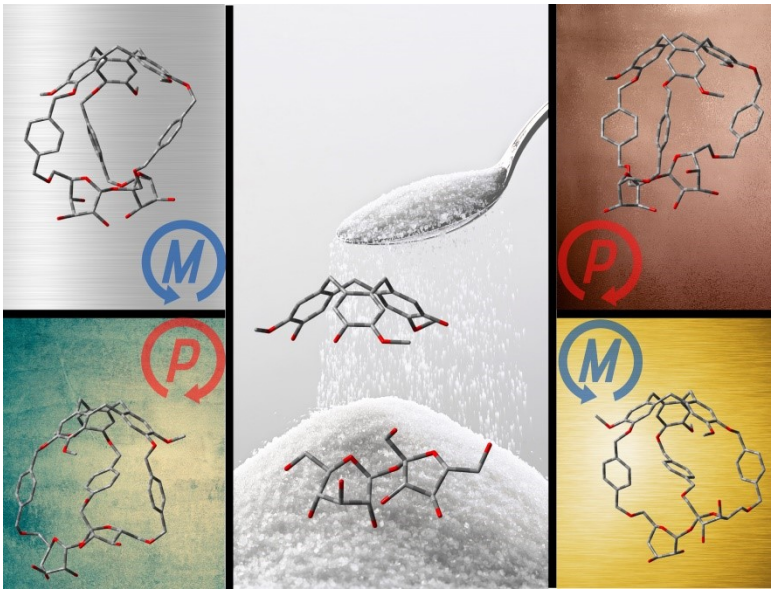
We also show that – depending on the conditions – it is possible to obtain either dimeric or monomeric product ('choose a size control')



We are also engaged in the synthesis of sucrose based cryptands (a) and molecular capsules (b); the latter were obtained from modified sucrose-triol and racemic cyclotriveratrylene (+/- CTV). This latter process, provides in very good yield four molecular capsules able to differentiate choline and acetylcholine.



b)



S. Jarosz, P. Sokołowska, Ł. Szyszka, *Tetrahedron Letters*, **2020**, *61*, 151888 **DIGEST paper**; see also Szyszka et. al. *Org. Lett.*, **2019**, *21,* 6523-6528; *EJOC*, **2021**, 897-906