Crystal structures of host-guest complexes of carboxylated pillar[5]arene with drugs

Helena Butkiewicz[1], Sandra Kosiorek[1], Volodymyr Sashuk[1], Oksana Danylyuk[1]

[1] Institute of Physical Chemistry Polish Academy of Sciences, Warsaw, Poland, hbutkiewicz@ichf.edu.pl

Supramolecular chemistry concentrates on the complex structures and studies of intermolecular interactions such as hydrogen bonds, π-π and electrostatic interactions that are responsible for aggregation of molecules into larger systems. The supramolecular chemistry assumptions are based on the phenomena of molecular recognition and self-organization. A host molecule with a cavity or pockets on its surface recognizes and binds the guest molecule. As a result of such self-organization a host-guest complex is formed. The most commonly used hosts in such supramolecular systems are macrocyclic compounds.

Carboxylated pillar[5]arene (CPA5), first reported by Ogoshi in 2010 [1], is highly symmetrical pillar-shaped compound, composed of hydroquinone units linked by methylene bridges at the para-positions and substituted by ten carboxylic acid groups. Its rigid hydrophobic, electron-rich cavity makes it great candidate as host molecule for various electron-deficient guests or other neutral molecules. Under basic conditions it acts as receptor for cations in water.

Here we want to present X-ray structures of the carboxylic acid substituted pillar[5]arene host–guest complexes with amidine and guanidine drugs. Chosen guest molecules are biologically and pharmaceutically important compounds used as antidiabetics (phenformin), antiseptics (alexidine), pneumocystis carnini pneumonia drug (pentamidine) and reversible competitive inhibitor of trypsin (benzamidine). Under physiological conditions they are protonated to form stable cations. The formation of supramolecular complexes between CPA5 and amidine and guanidine drugs may prevent side effects and potentially enable the obtaining of new transport and drug release systems under different conditions.

[1] Ogoshi T, Hashizume M, Yamagishi T, Nakamoto Y. Synthesis, conformational and host–guest properties of water-soluble pillar[5]arene. ChemComm, 21, 3708-3710 (2010)

A.K.A. acknowledges: This work was supported by funding from Polish National Science Centre (PRELUDIUM 14, No. 2017/27/N/ST5/01931).