Aromatic Heterocycles Modeled in TorchLite

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Abstract

The XED force field uses multi-poles to model negative electron density resulting in enhanced description of intramolecular interactions and substituent effects on aromatic systems. The effect of using the XED force field was studied by modeling the positive and negative molecular interaction fields around a series of well-known heterocyles.

Method

Benzene was loaded into TorchLite using the 'Create Molecules from SMILES' menu entry. The resulting three dimensional structure was mutated into alternative aromatic species using the inbuilt molecular editor accessed through the 'Edit a Copy' feature. The species modeled were fluorobenzene, pyridine, indole, benzoxazone, azulene, ixazole, and pyrrole. Comparison of the obtained patterns shows some interesting similarities as well as significant differences (figure 1).

Results

The patterns obtained for fluorobenzene and pyridine are similar as would be expected for these known bioisosteres. However, the pattern they show some similarity to both ozazoles and intriguingly azulene. The strong dipole on this latter heterocycle is in agreement with that observed experimentally and shows how the complex charging model of the XED force field can make a significant difference to the field pattern of many heterocycles.

Conclusion

TorchLite is a molecular editor and viewer that displays molecules in 2D or 3D with their associated field patterns and physicochemical properties. It can be used to analyze activity, toxicity and ADME properties and correlate them with molecular fields.

TorchLite is available for free from: www.cresset-group.com/product/torchlite

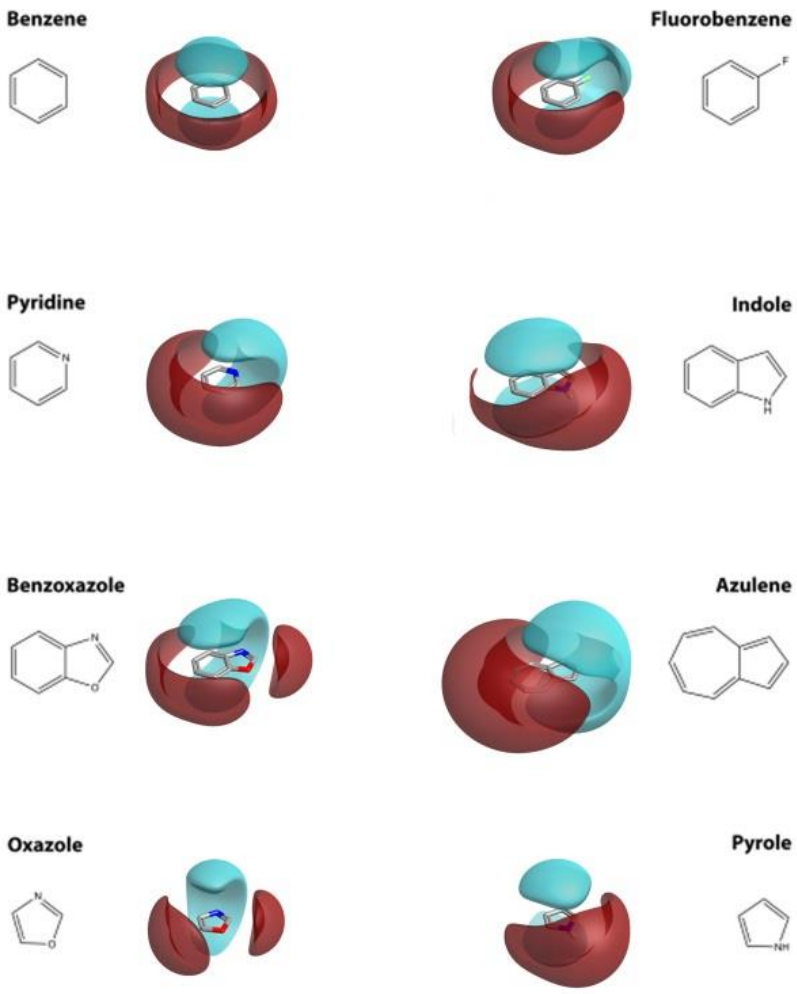

Figure 1: Aromatic Heterocycles Modeled in TorchLite.