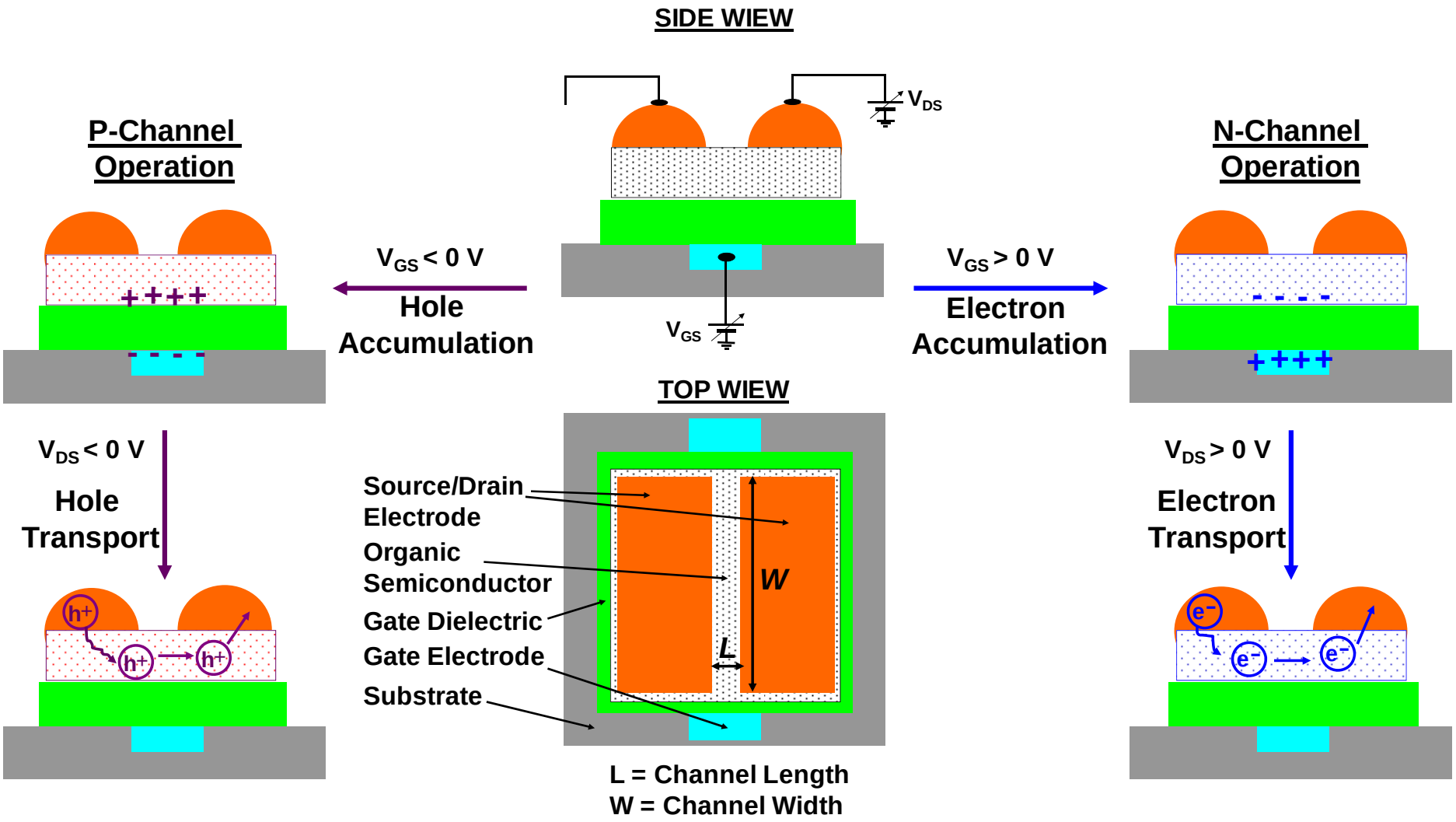


FIGURE 10.1. OFET device structure with highlighted materials component (center) and p-channel (right) and n-channel (left) operation.

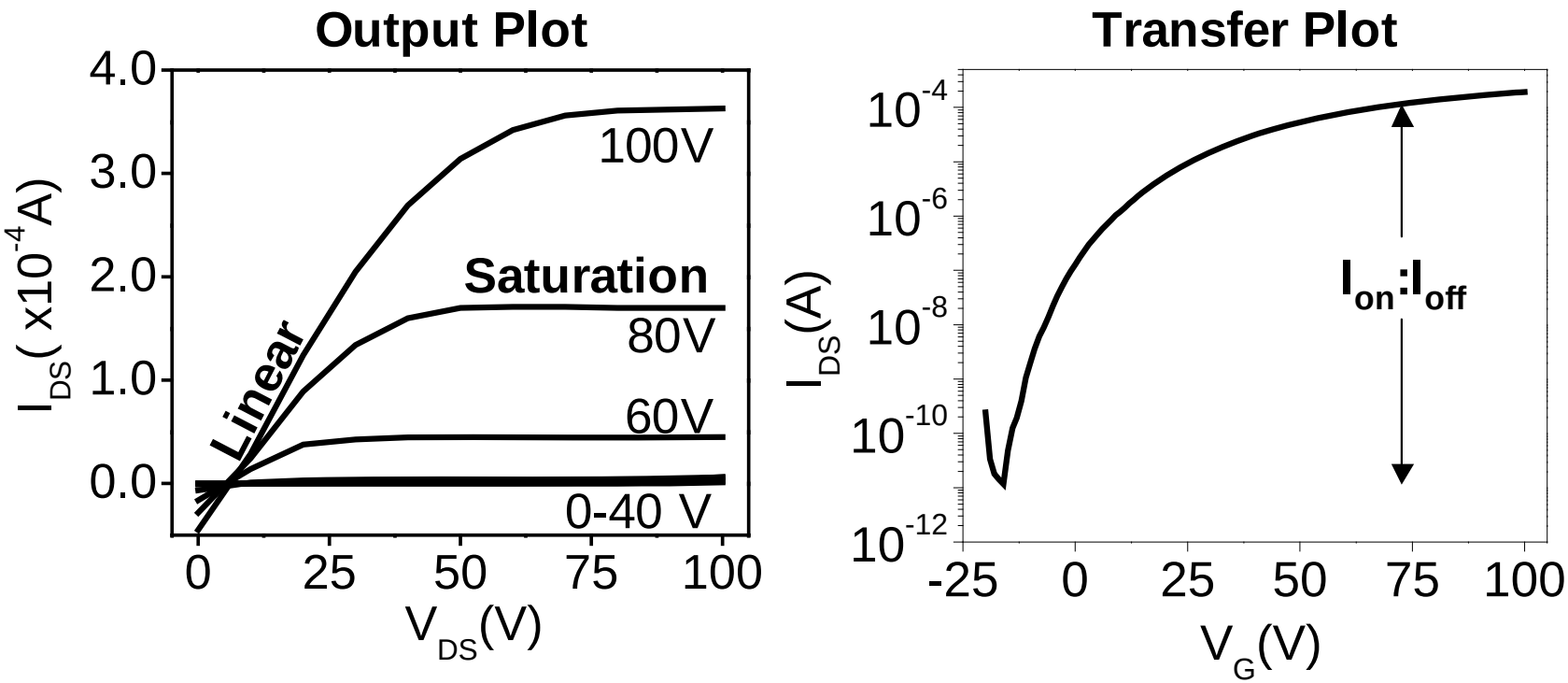


FIGURE 10.2. Example of output and transfer plots for an n-channel semiconductors.

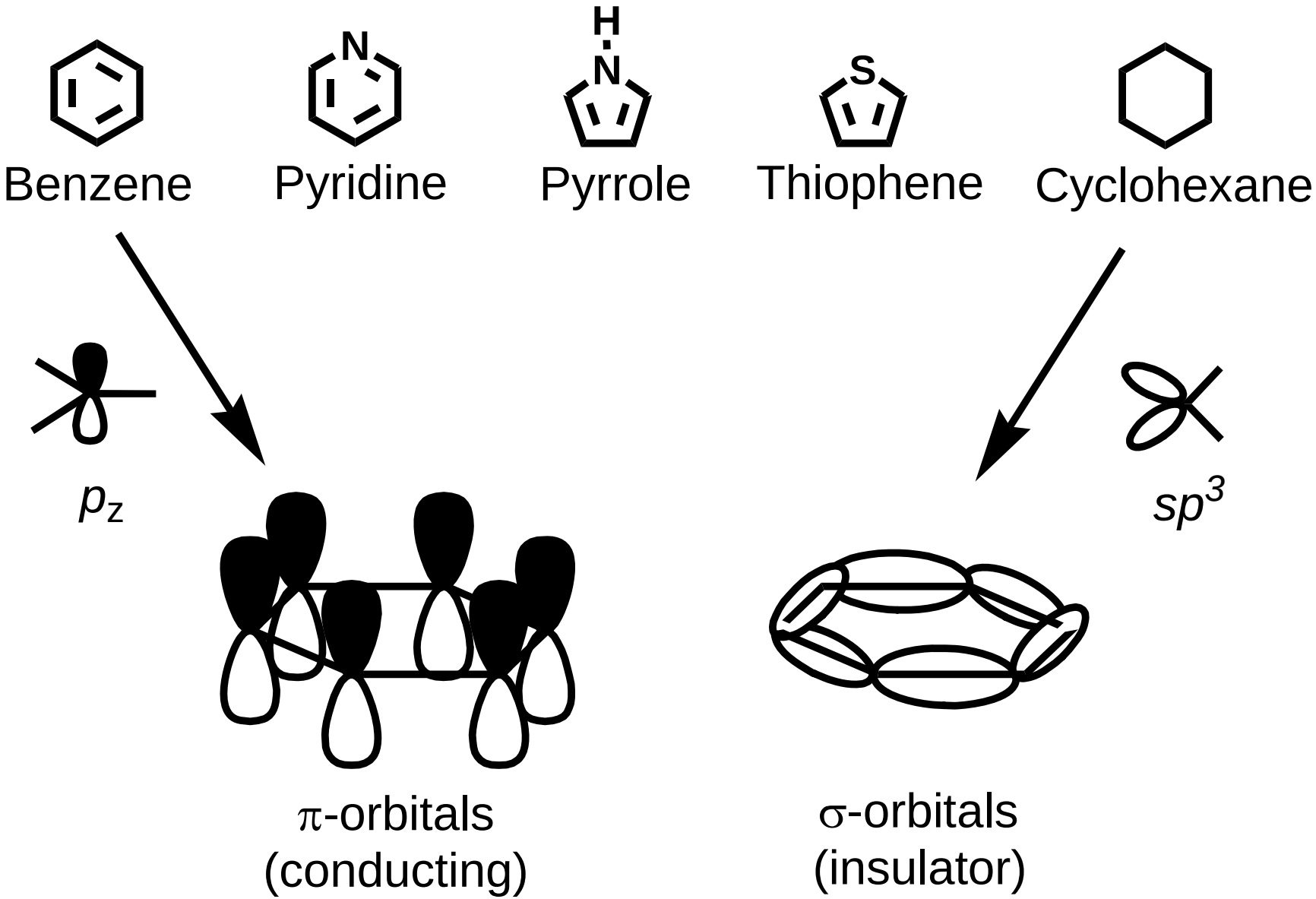


FIGURE 10.3. Chemical structure of common (hetero)aromatic rings and cyclohexane generating conducting and insulating molecular orbitals, respectively.

Introduction to Organic Electronic and Optoelectronic Materials and Devices (Eds. Sun & Dalton) CRC Press, 2008. ISBN-10: 0849392845

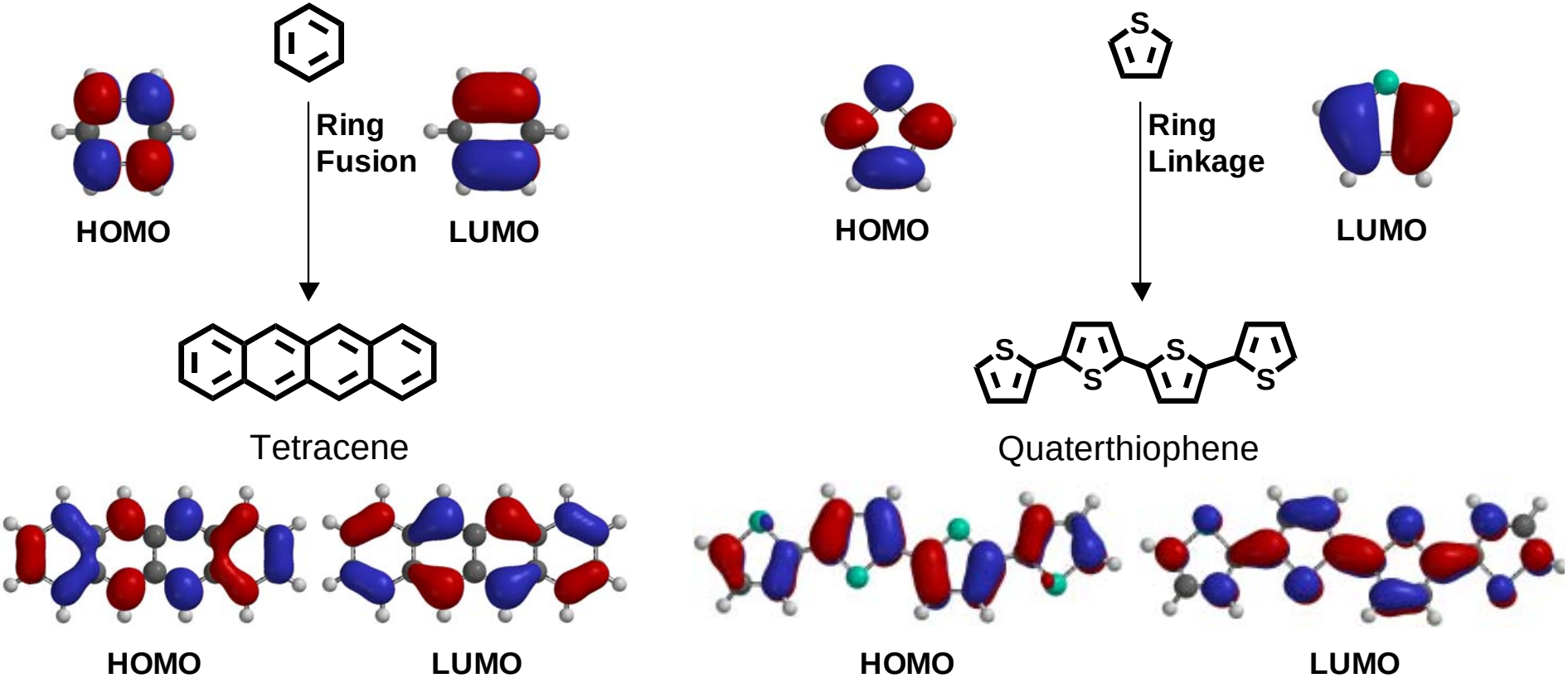


FIGURE 10.4. HOMOs and LUMOs of benzene (left) and thiophene (right) and of the corresponding molecular semiconductors trtracene and quaterthiophene, respectively.

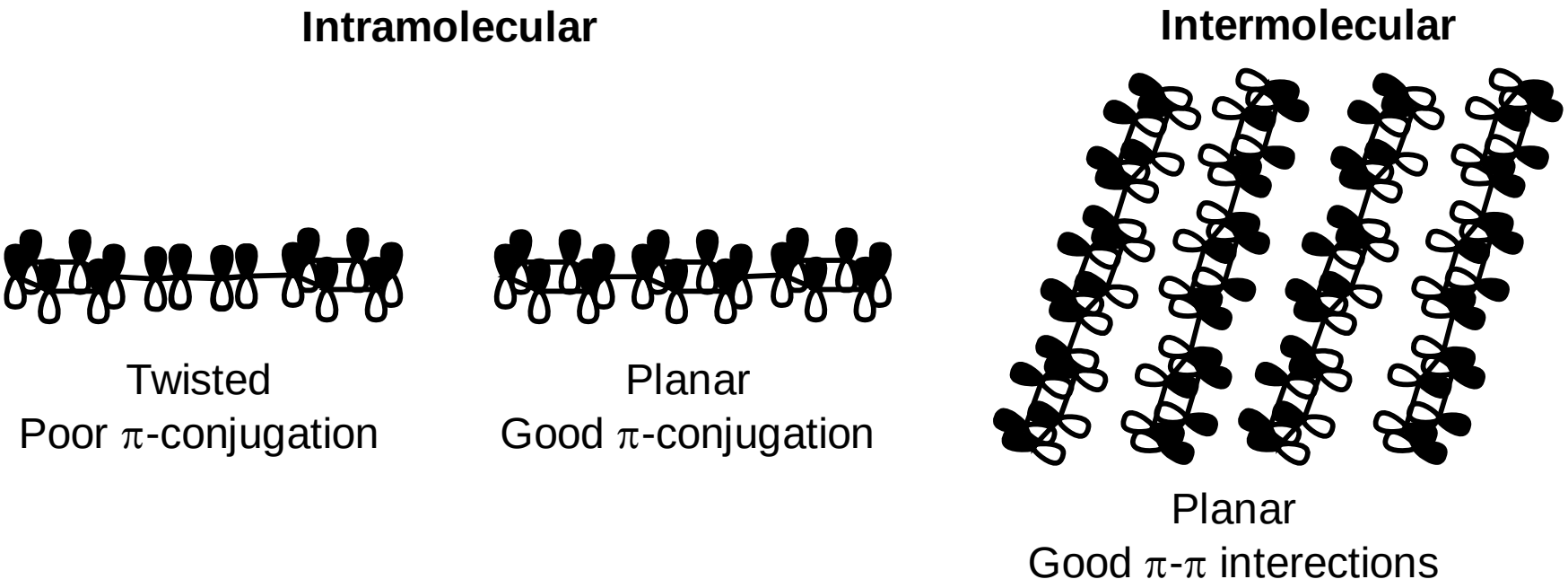


FIGURE 10.5. Schematic representation of twisted and planar conformations affecting intramolecular π-conjugation and intermolecular packing.

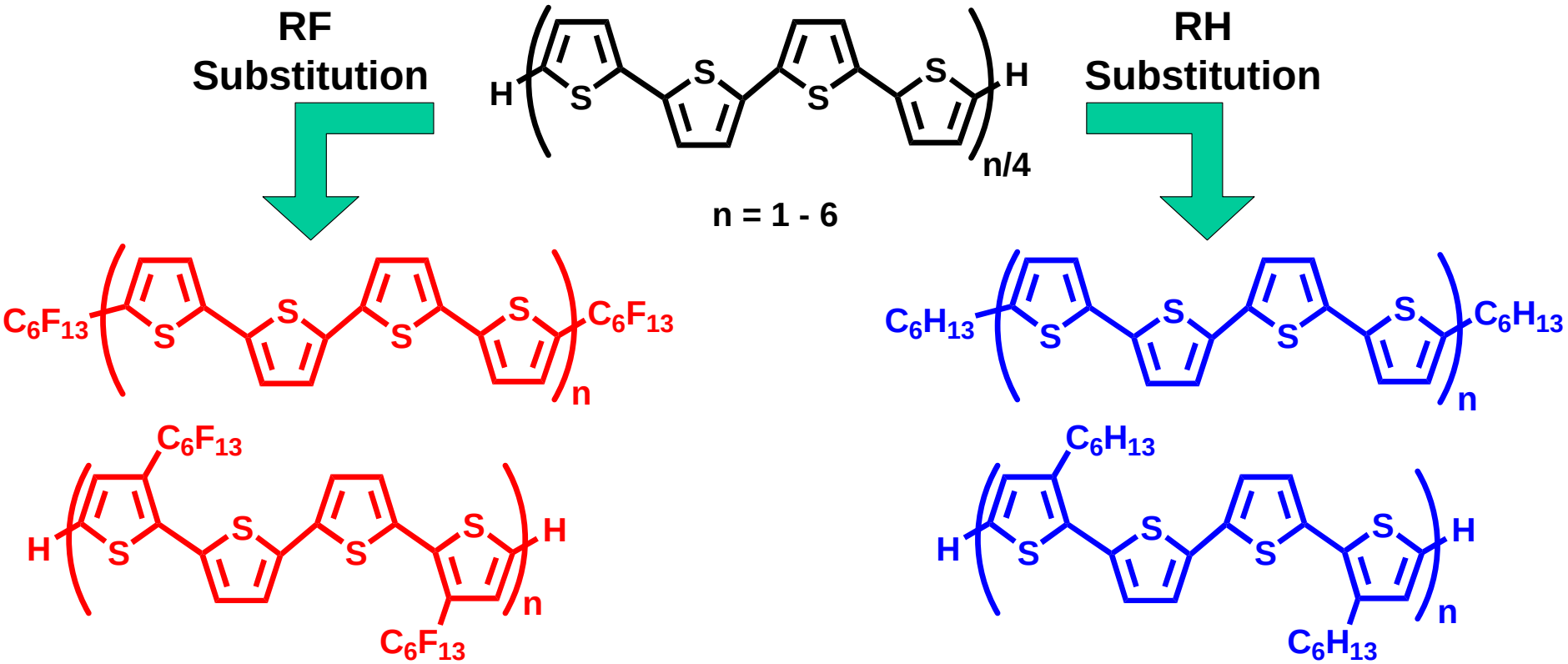


FIGURE 10.6. Chemical structure of oligothiophenes (nTs) and the corresponding α,ω-disubstituted derivatives with perfluorohexyl (DFH-nTs) and hexyl (DH-nTs) chains.

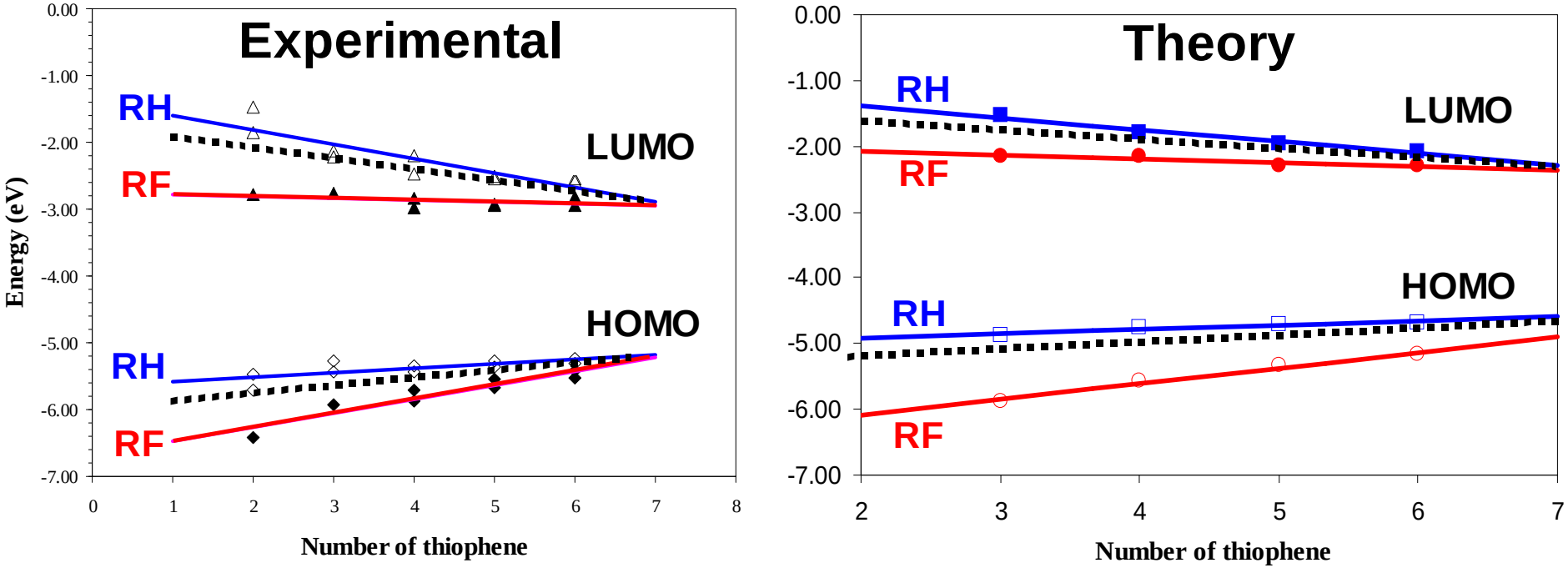


FIGURE 10.7. Experimental and theoretical HOMO and LUMO energy plots versus the number core thiophene unit (n) for DFH-nTs and DH-nTs.

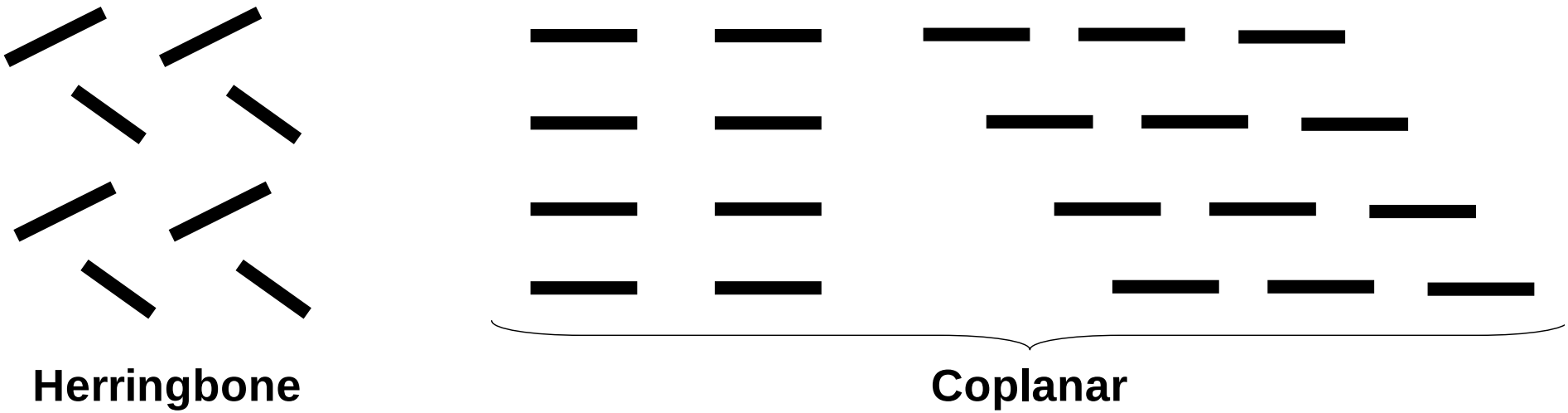
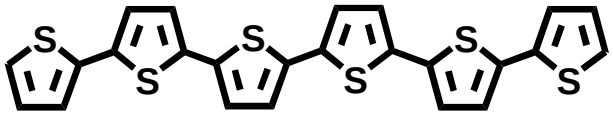
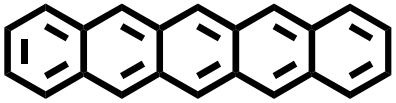


FIGURE 10.8. Schematic representation of herringbone and coplanar molecular packings.



Sexithiophene (6T)



Pentacene (P5)

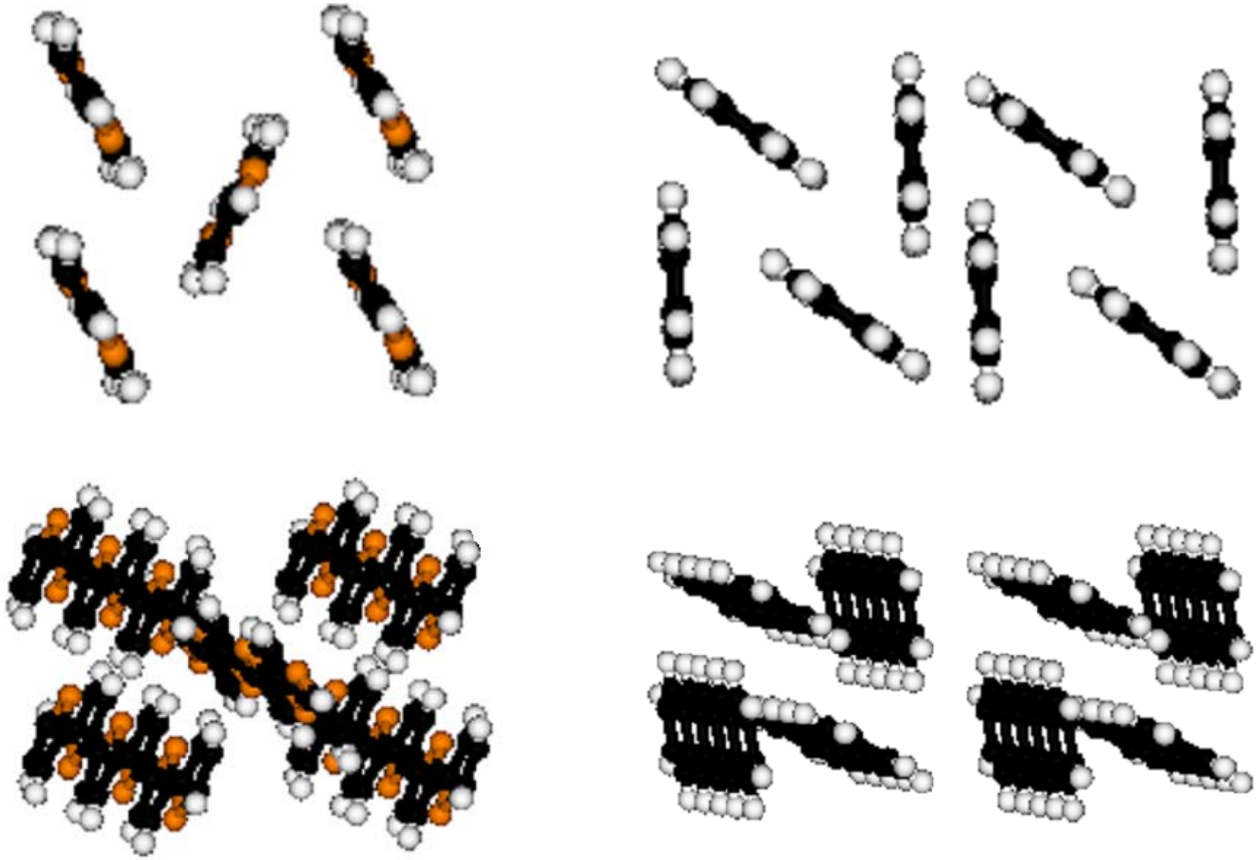


FIGURE 10.9. Crystal structures of sexithiophene and pentacene.

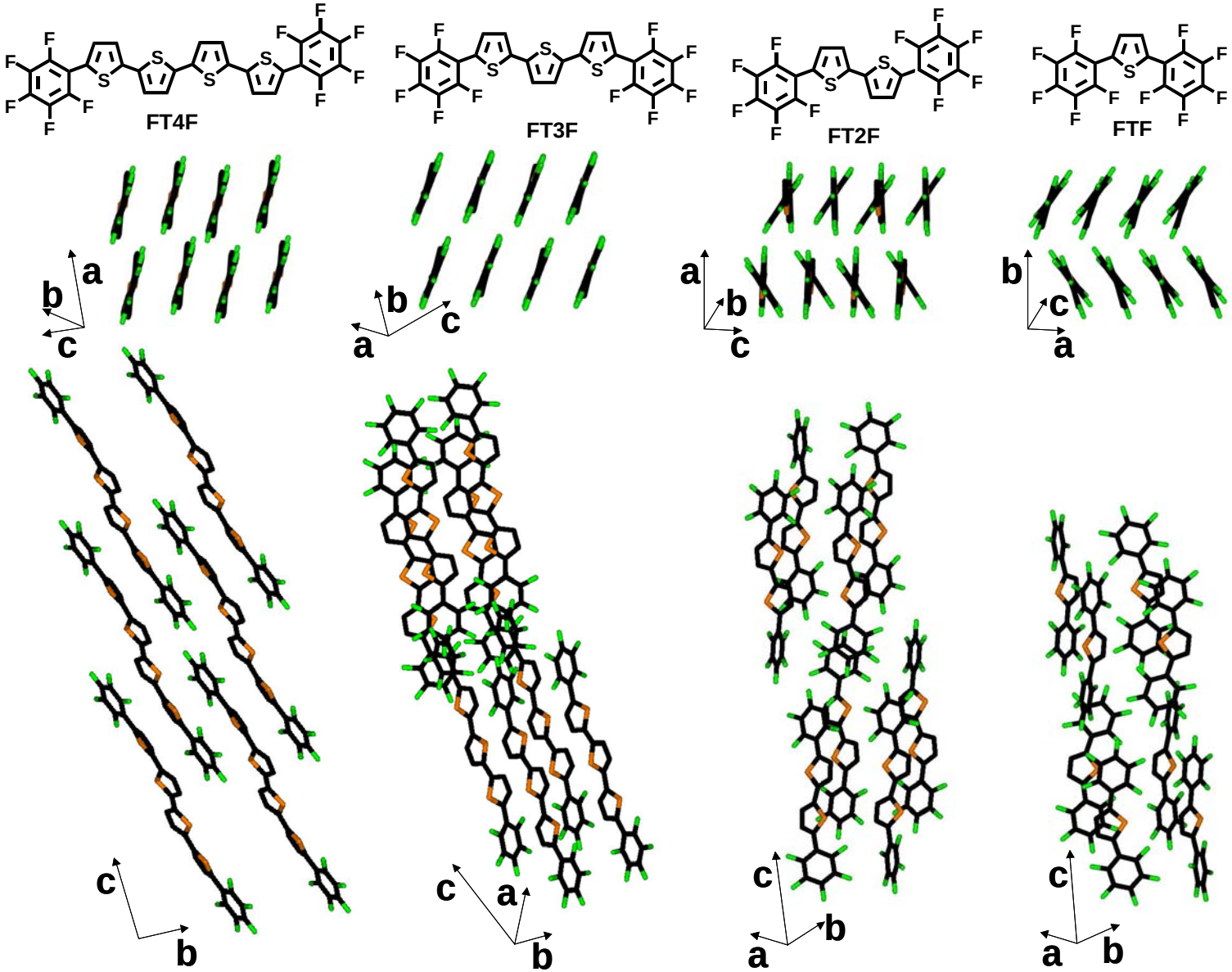


FIGURE 10.10. Crystal structure of mixed perfluoroarene-thiophene oligomers (FTnFs).

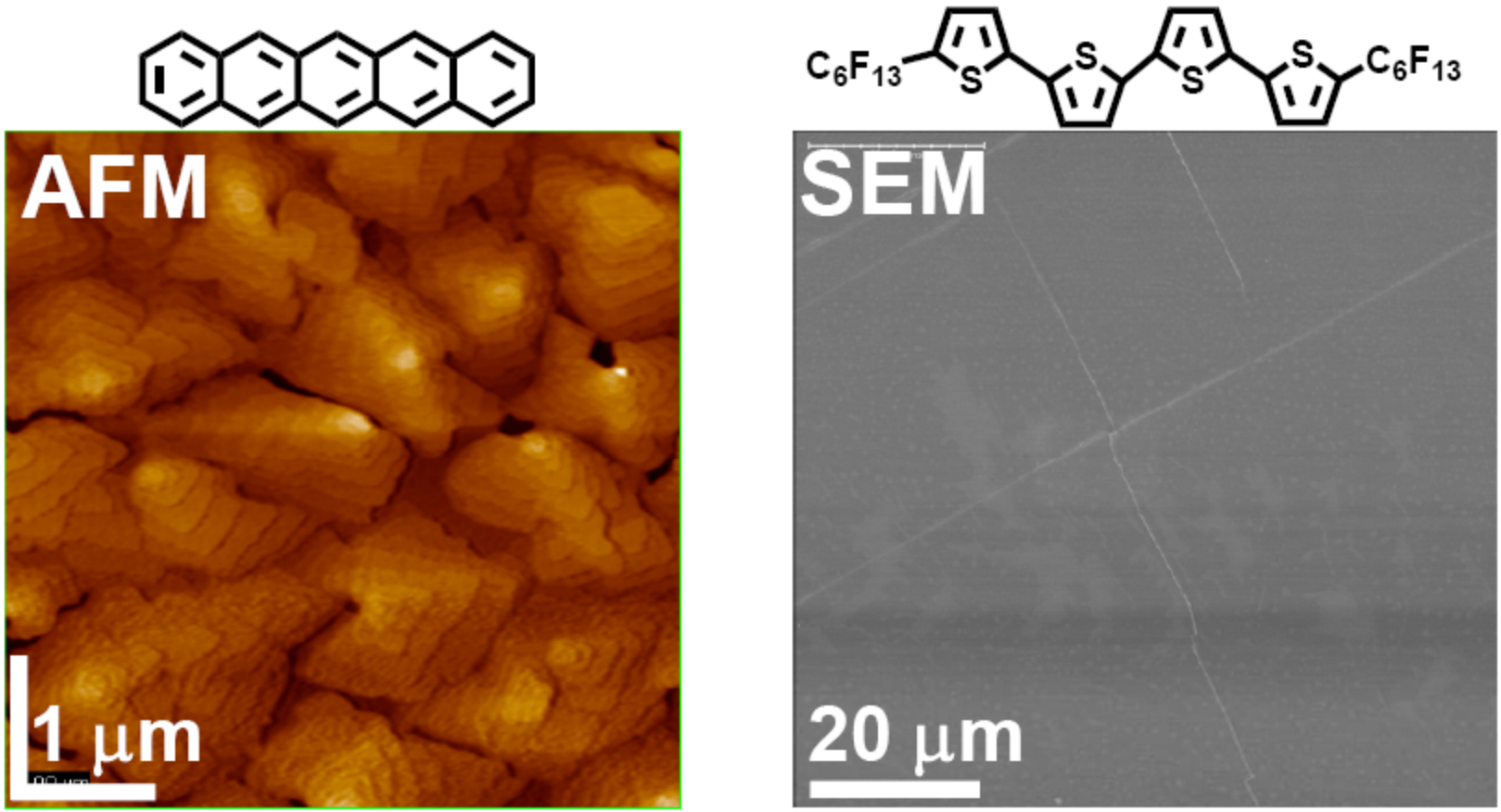


FIGURE 10.11.AFM and SEM images of pentacene and DFH-4T films, respectively.

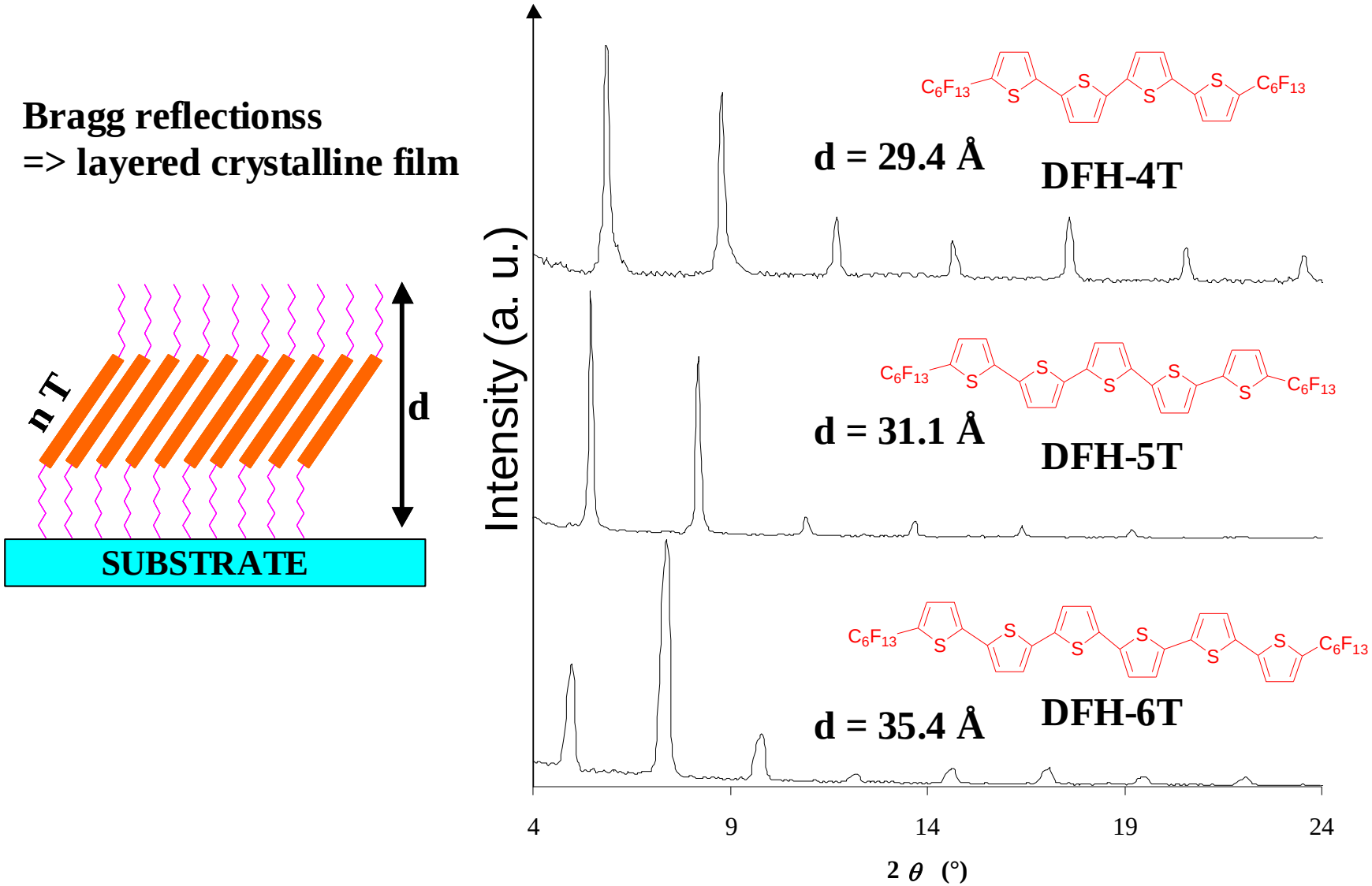


FIGURE 10.12. Schematic representation (left) of molecular orientation of DFH-nT (n = 4, 5, and 6) molecules on the SiO_2 surface. XRD plots of DFH-nT films vapor-deposited on Si-SiO_2 substrates.

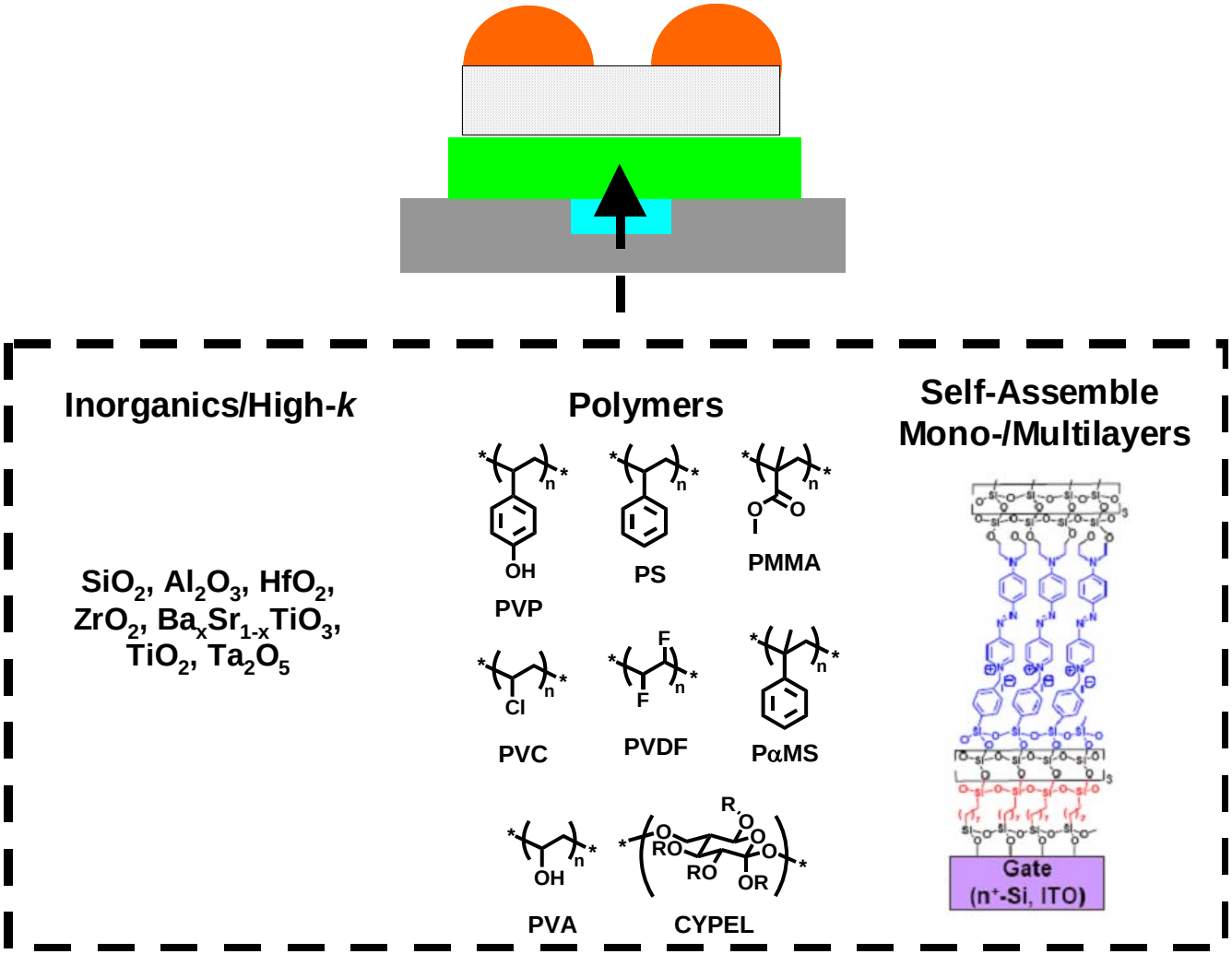


FIGURE 10.13. Gate insulator families used on organic TFTs.

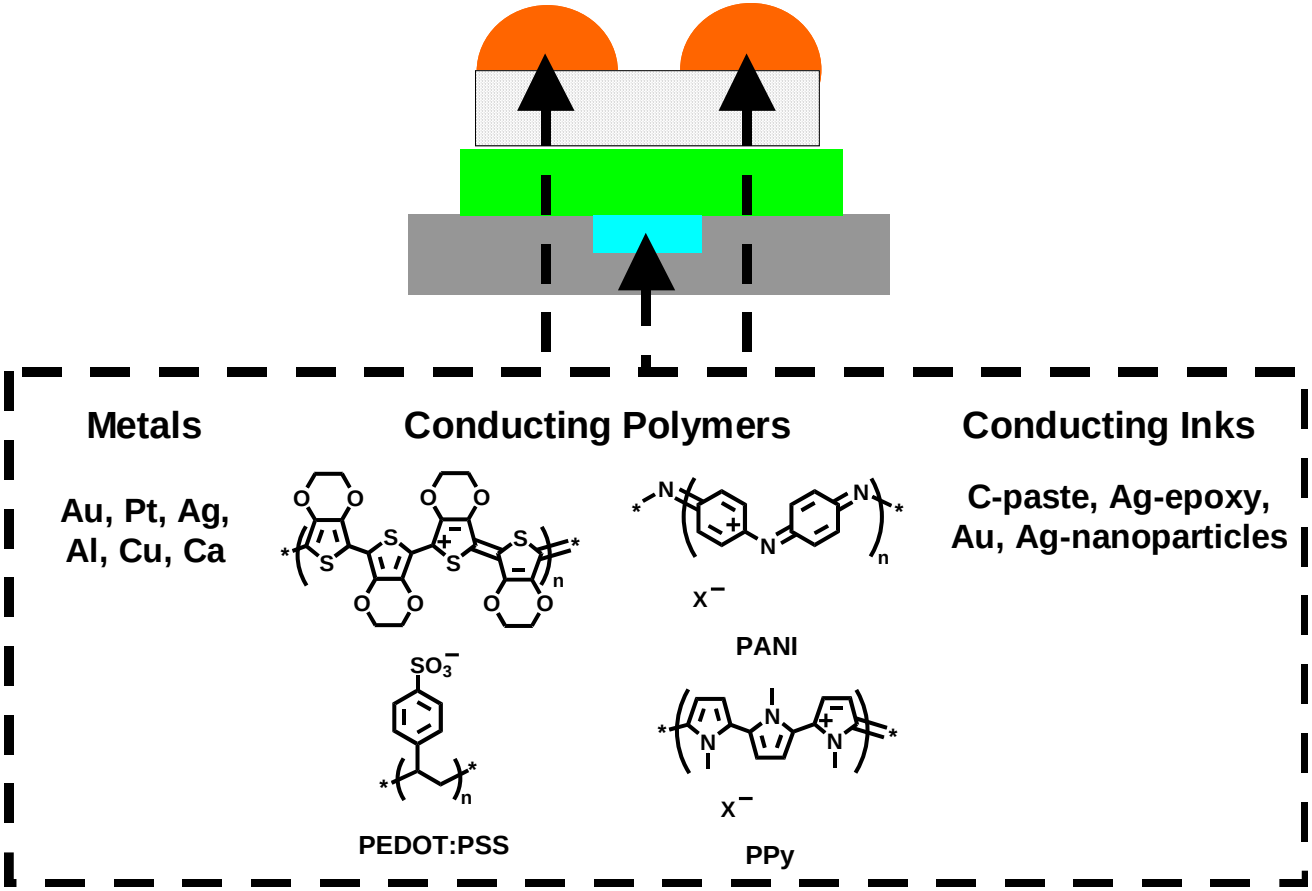


FIGURE 10.14. Conducting materials used in organic TFTs.

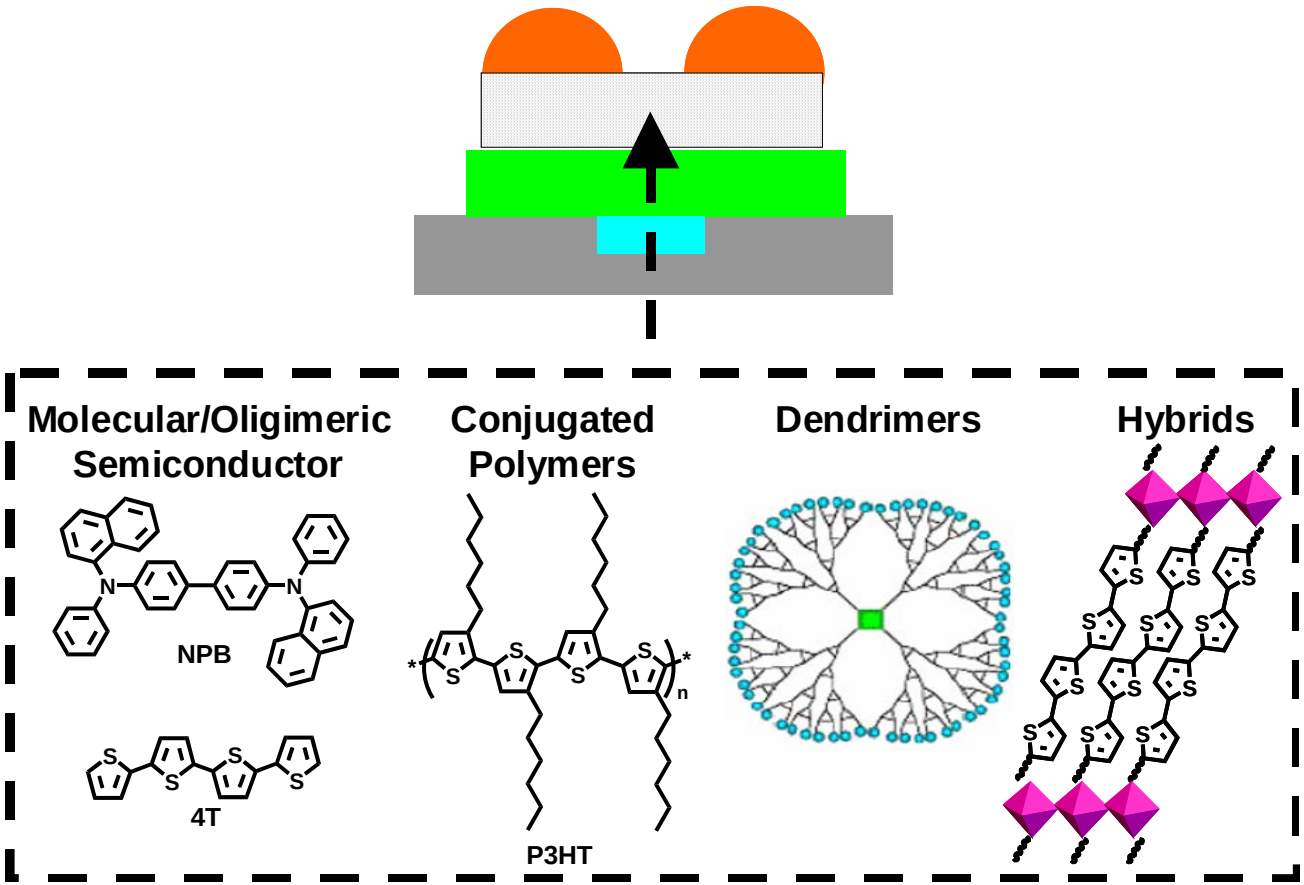
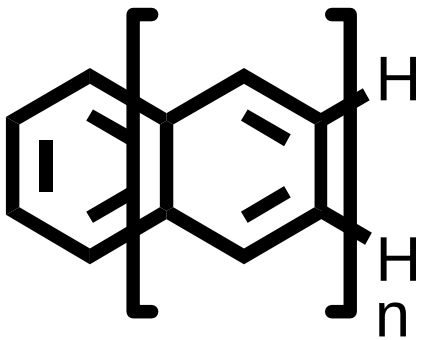
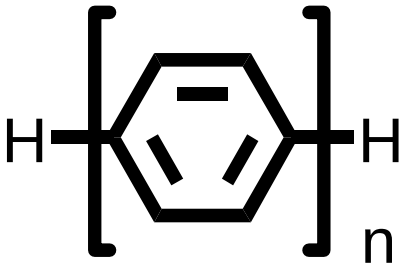


FIGURE 10.15. Semiconducting families used in organic TFTs.



[*n*]-Acenes



Oligophenylenes

FIGURE 10.16. General structure of [*n*]-acenes and oligophenylenes.

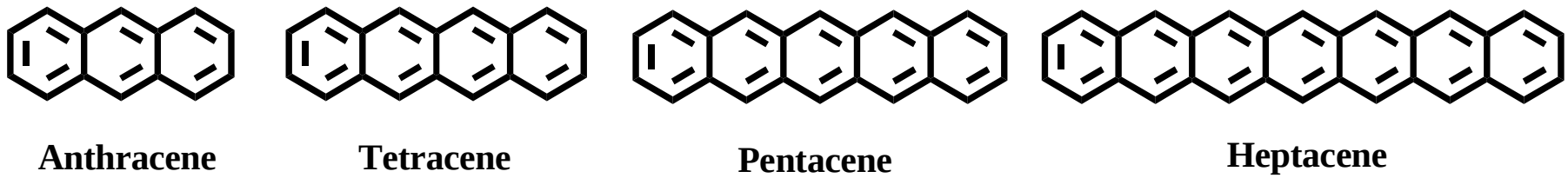


FIGURE 10.17. Chemical structure of anthracene, tetracene, pentacene, and heptacene.

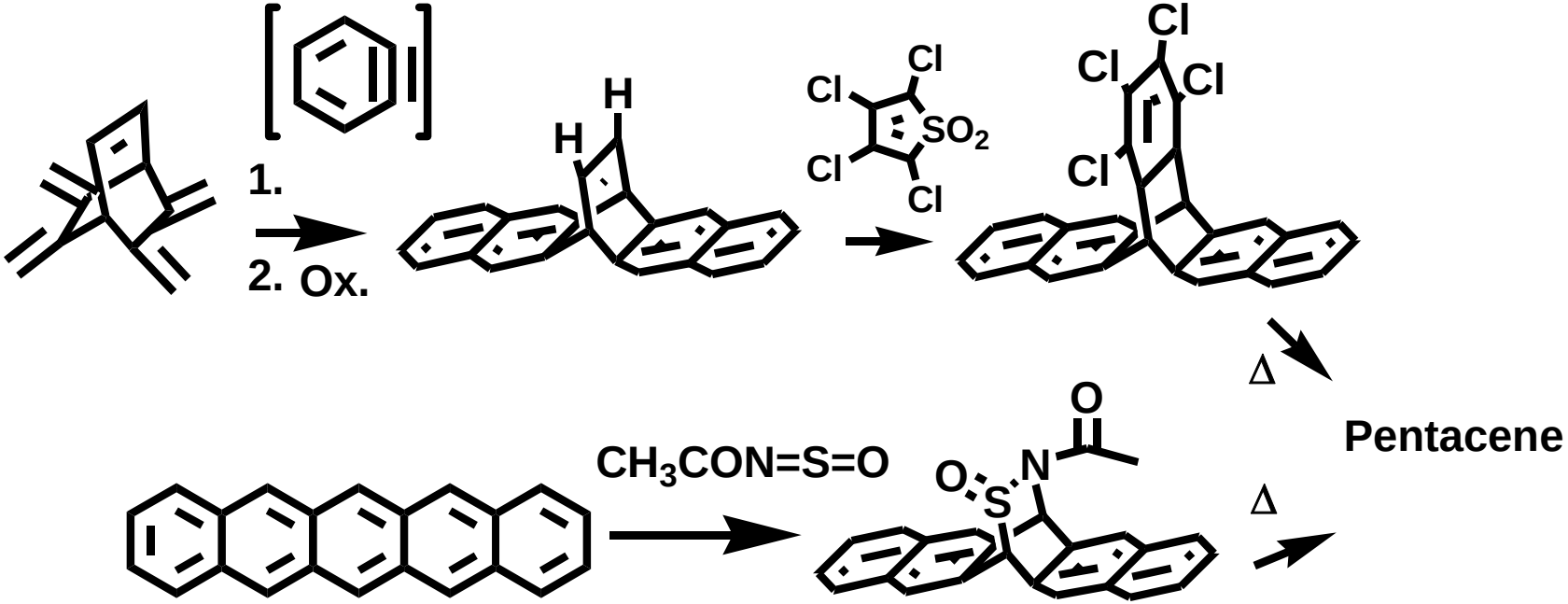


FIGURE 10.18. Synthetic routs to soluble pentacene precursors and back to pentacene upon heating.

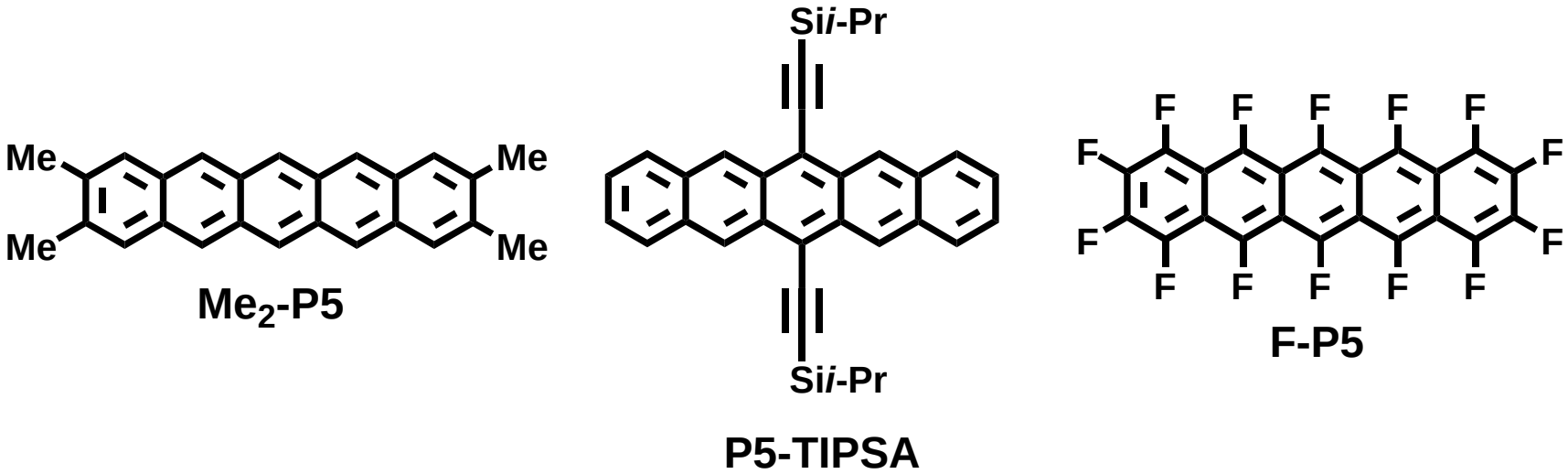


FIGURE 10.19. Chemical structure of various pentacene derivatives

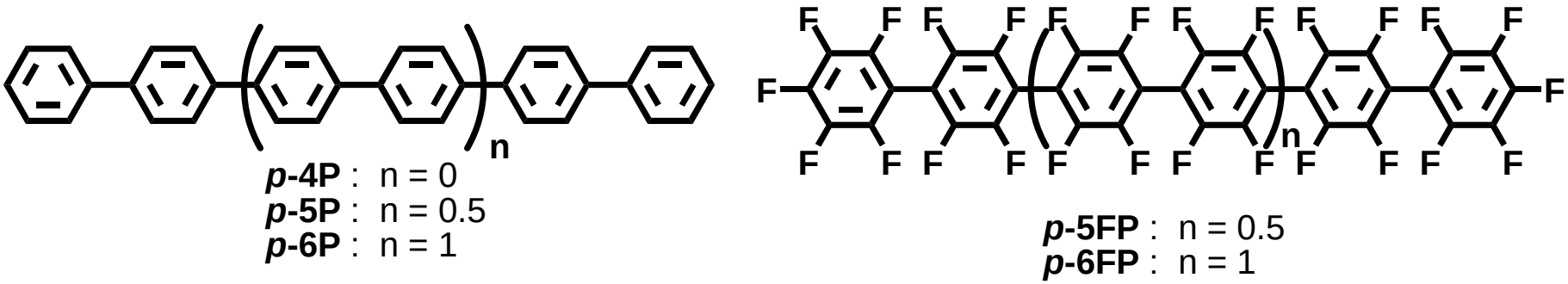


FIGURE 10.20. Chemical structure of various oligophenylene derivatives.

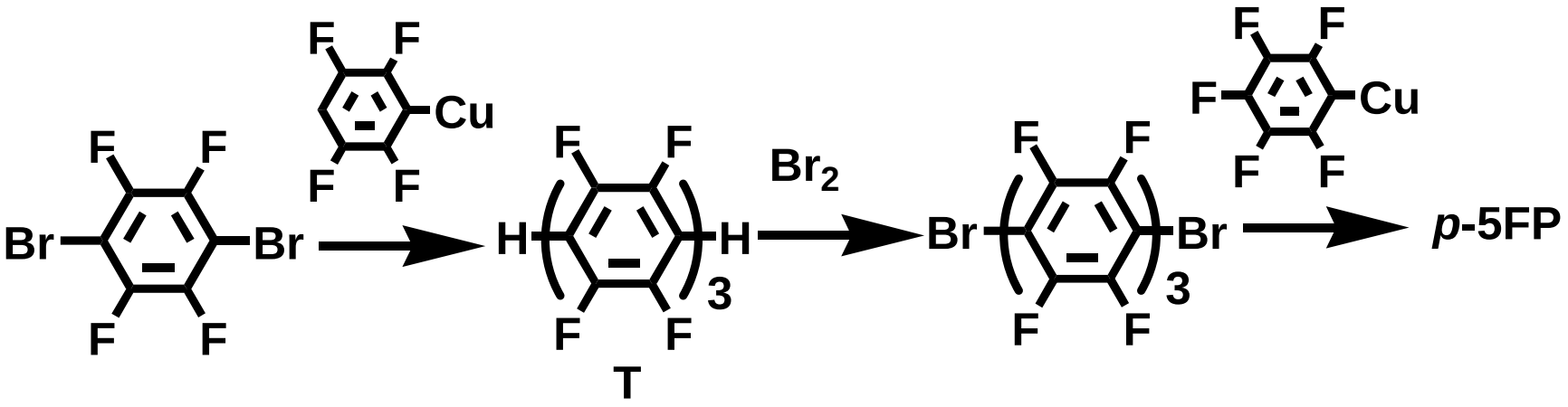
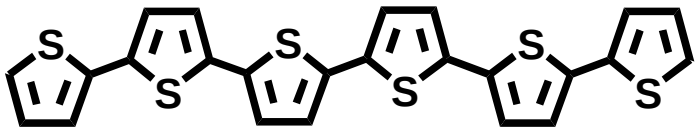
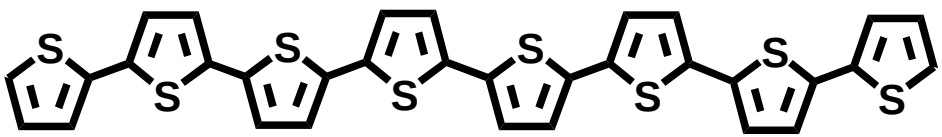


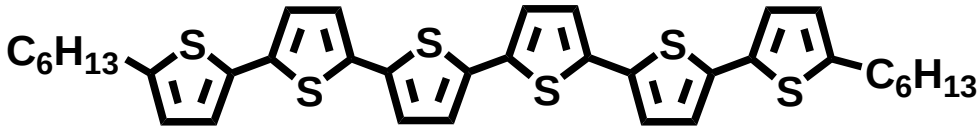
FIGURE 10.21. Synthesis of *p*-5FP.



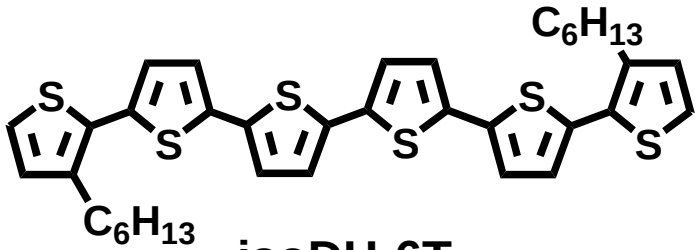
6T



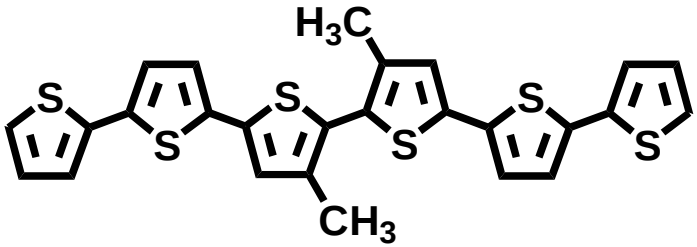
8T



DH-6T



isoDH-6T



Me_2-6T

FIGURE 10.22. Chemical structure of various sexithiophene derivatives.

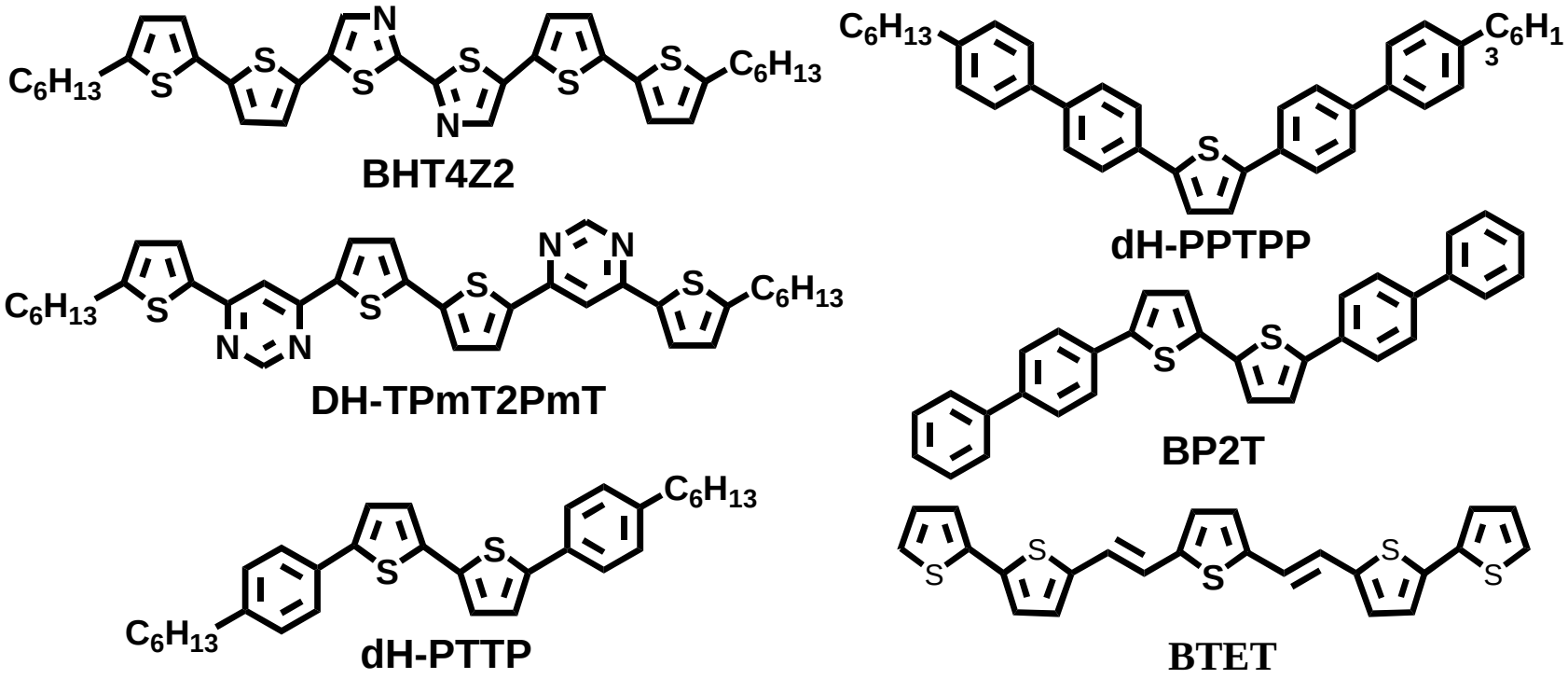
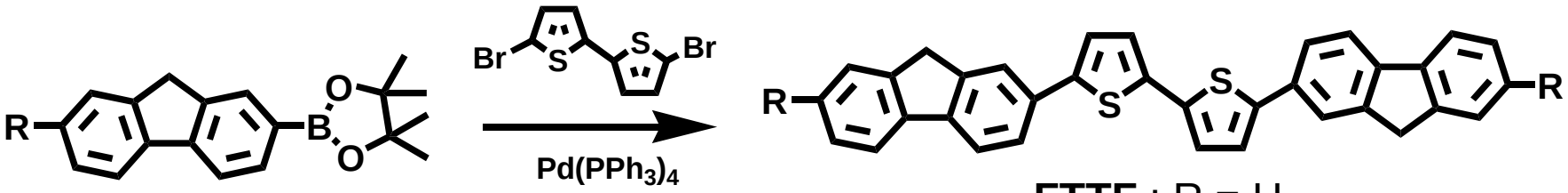
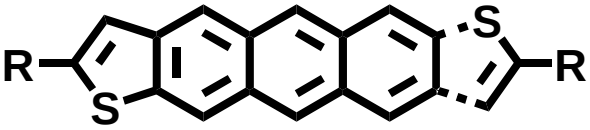


FIGURE 10.23. Chemical structure of various thiophene-based small molecules.

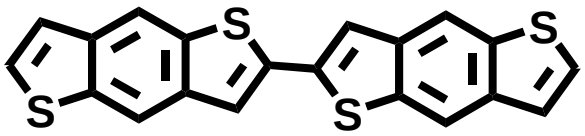


FTTF : R = H
DH-FTTF : R = C_6H_{13}

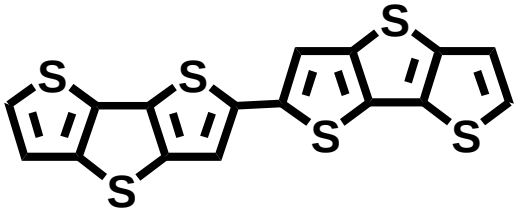
FIGURE 10.24. Synthesis and chemical structure of fluorine-based molucules.



ATD : R = H
DHATD : R = C_nH_{2n+1}

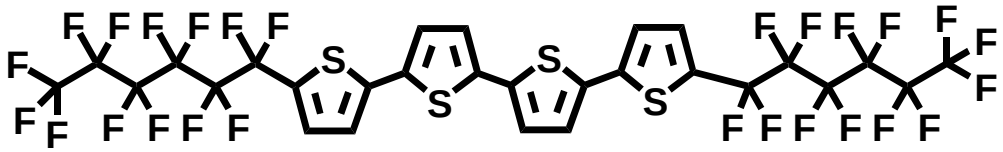


bis-BDT

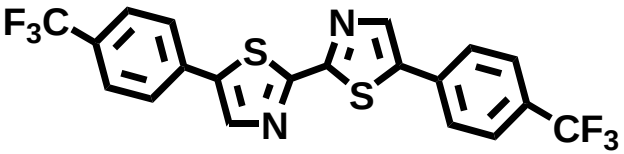


bis-TDT

FIGURE 10.25. Chemical structure of ATD, BDT, and TDT derivatives.



DFH-4T



CF-PTZ

FIGURE 10.26. Chemical structures of SDF-4T and CF-PTZ.

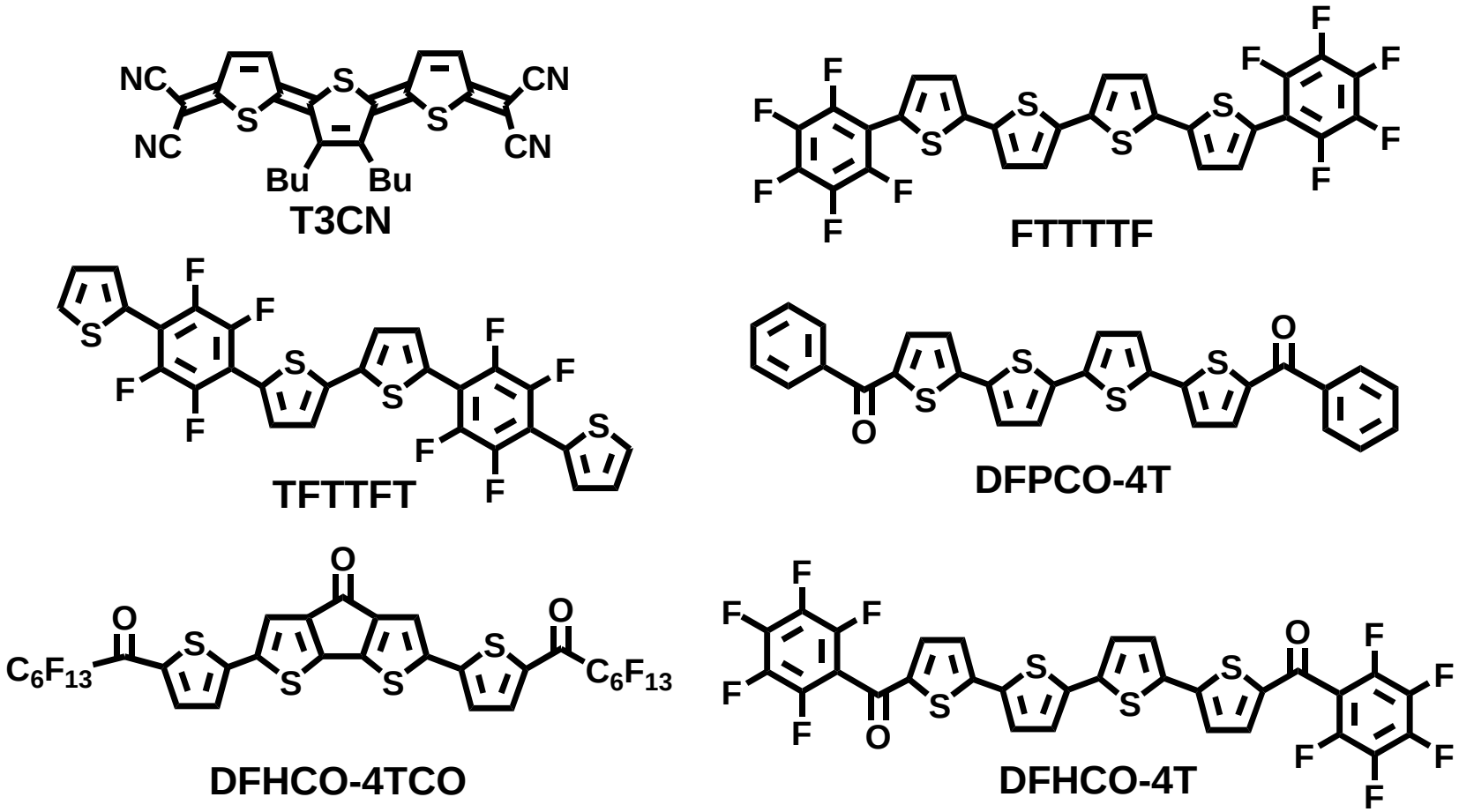


FIGURE 10.27. Chemical structures of various thiophene-based n-channel semiconductors.

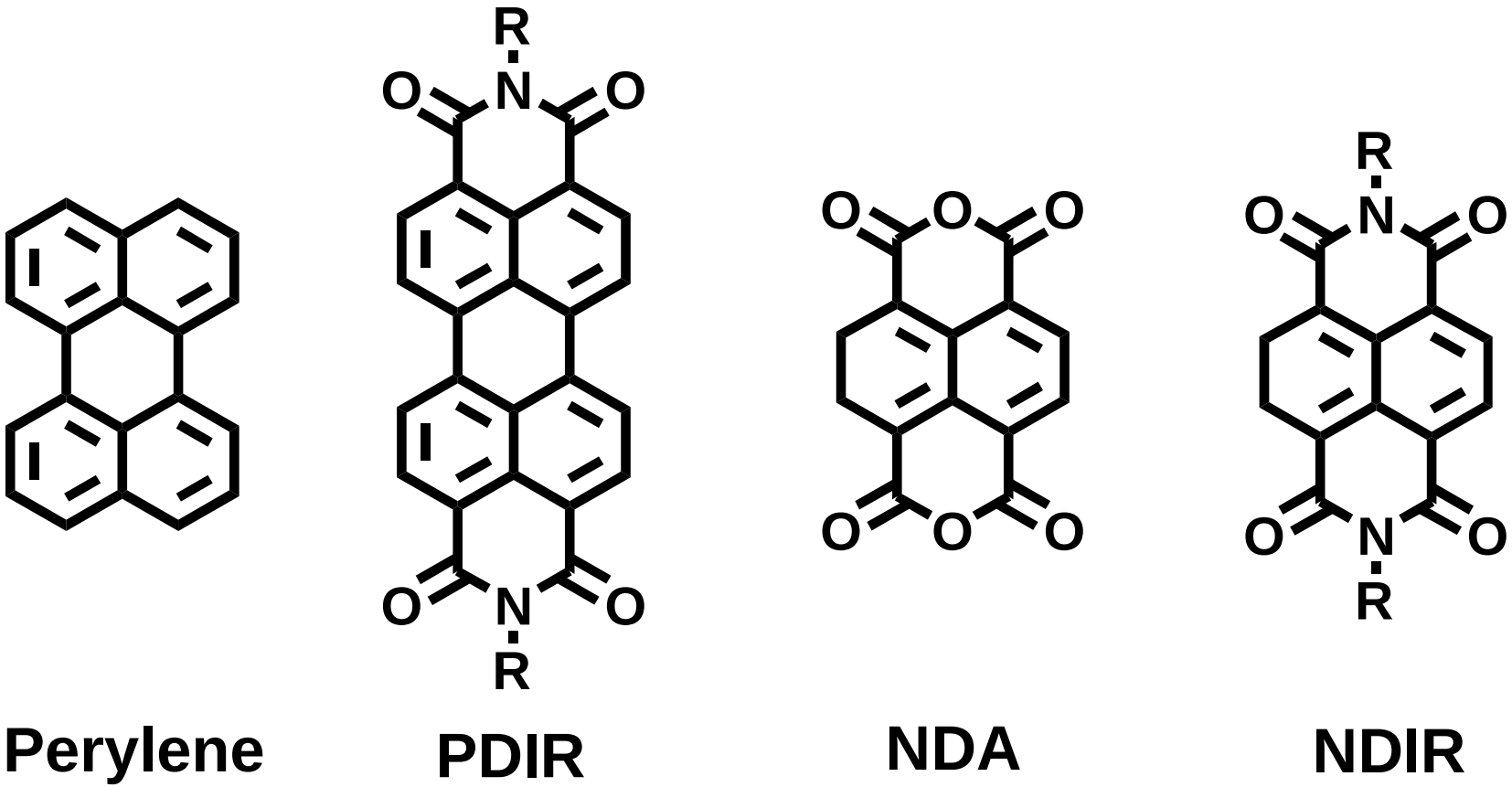
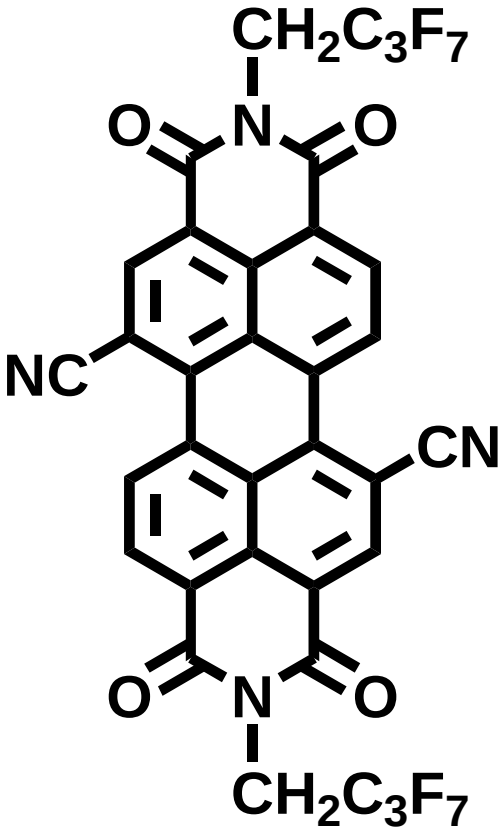
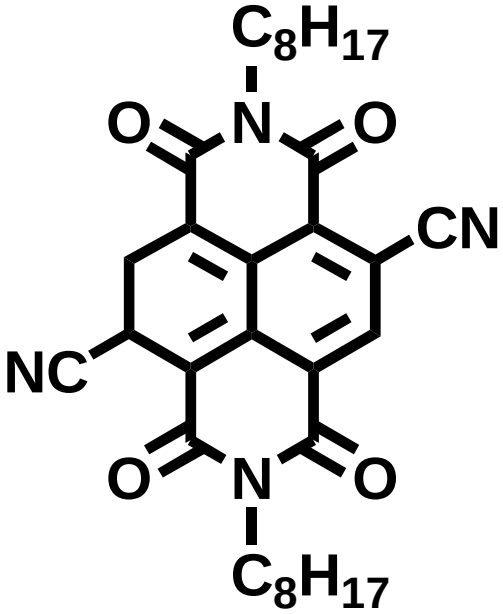


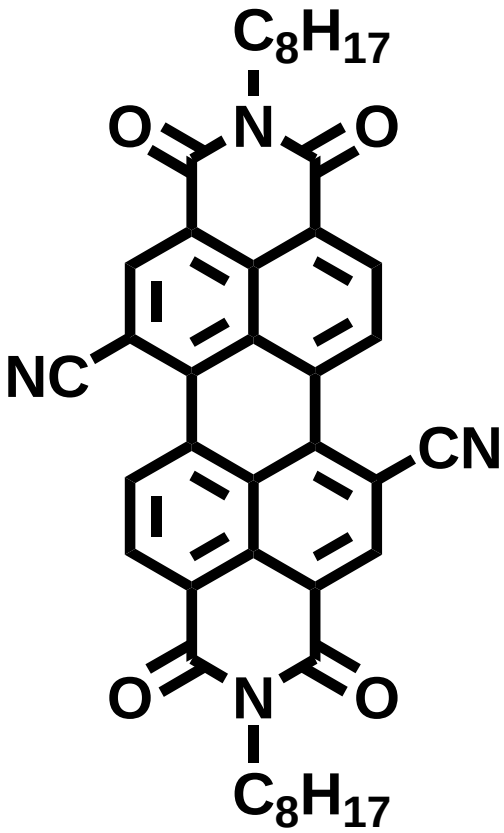
FIGURE 10.28. Chemical structures of perylene and naphthanedianhydride (NDA) and corresponding *N*-alkyl-tetracarboxydiimides.



PDIF-CN_2

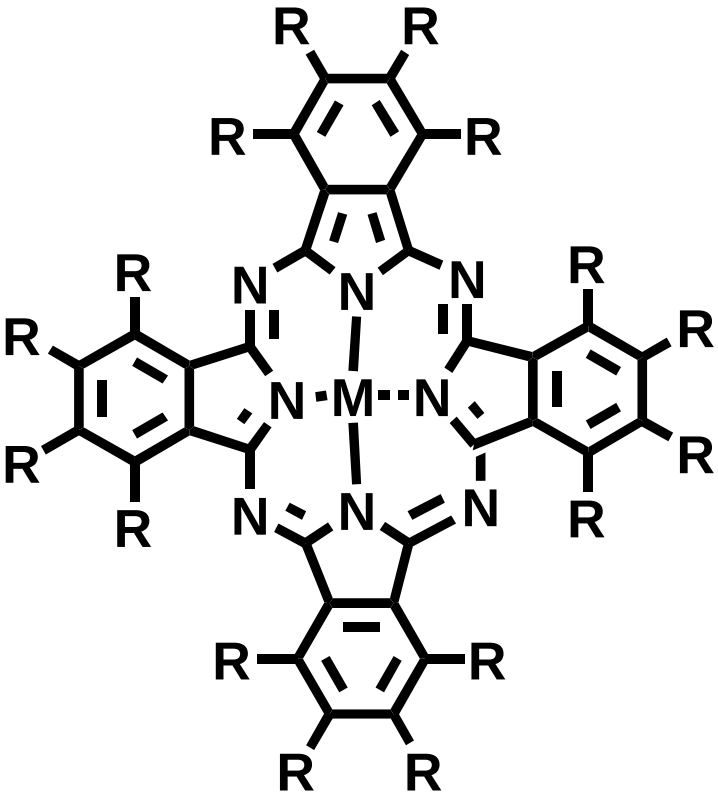


NDI8-CN_2

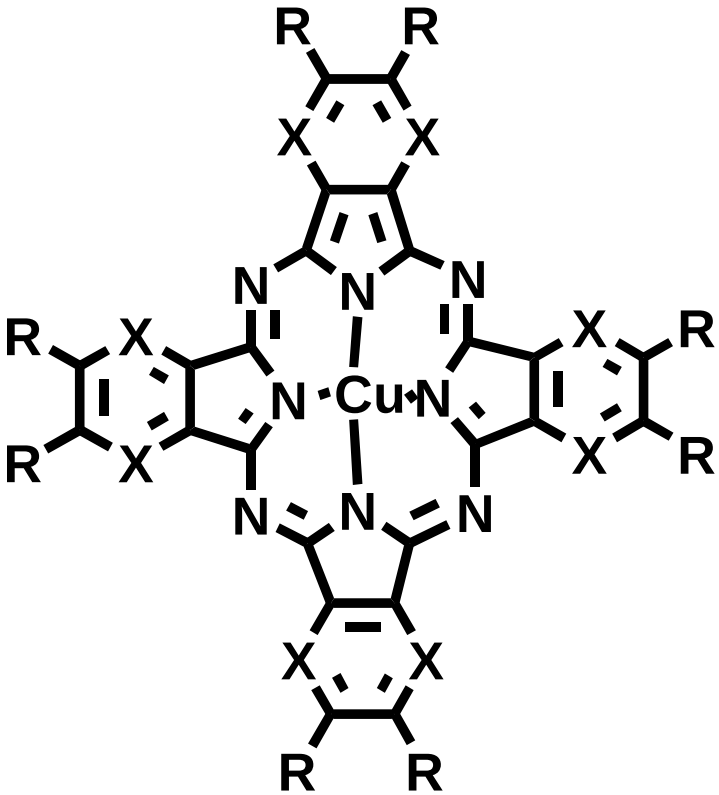


PDI8-CN_2

FIGURE 10.29. Chemical structures of various core-cyanated PDI and NDI derivatives.



M = Cu, Zn, Fe, Co, Ni, H_2
R = H, F, Cl, OAlkyl



$(CN)_8$CuPc : R = CN, X = CH
PyCuPc : R = H, X = N

FIGURE 10.30. Chemical structures of various matalphthalocyanines.

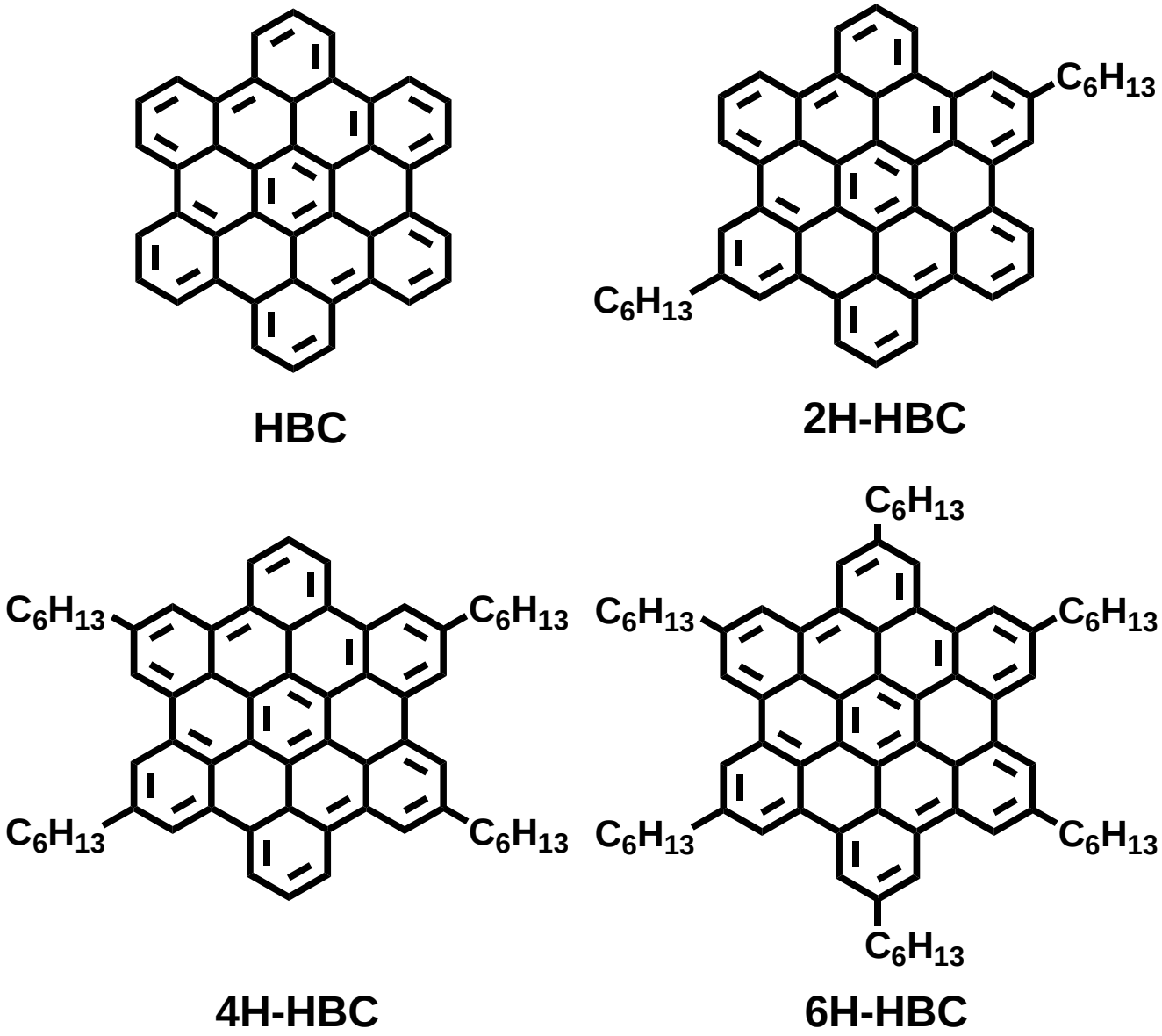
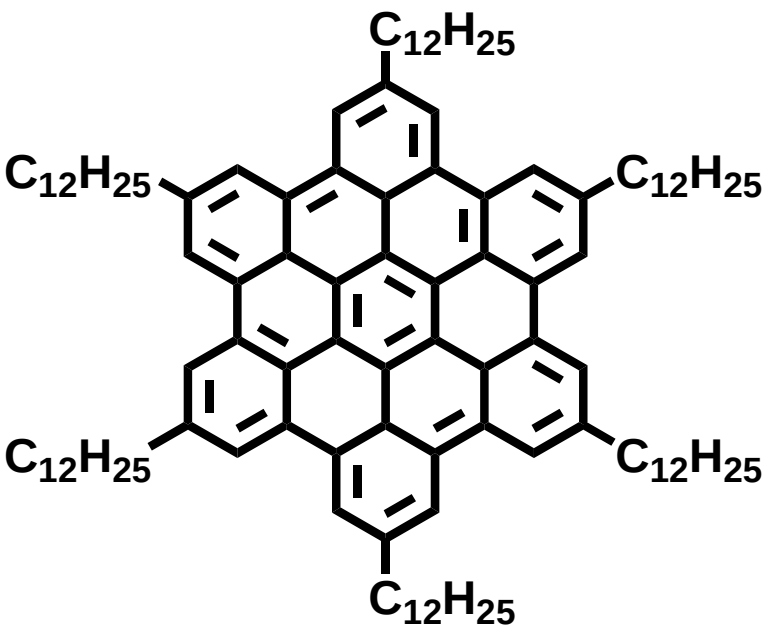
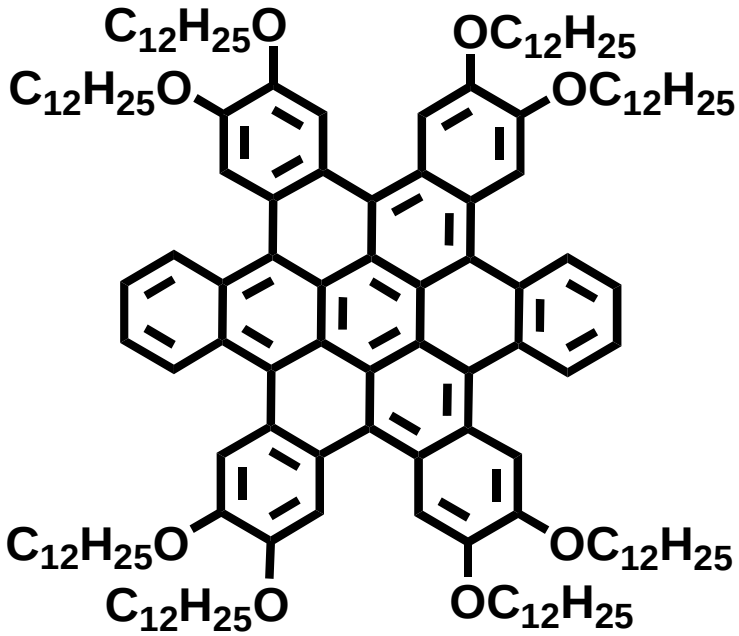


FIGURE 10.31. Chemical structures of various hexabenzocoronene derivatives.



HBC-C_{12}



HBC-OC_{12}

FIGURE 10.32. Chemical structures of HBC-C_{12} and HBC-OC_{12}.

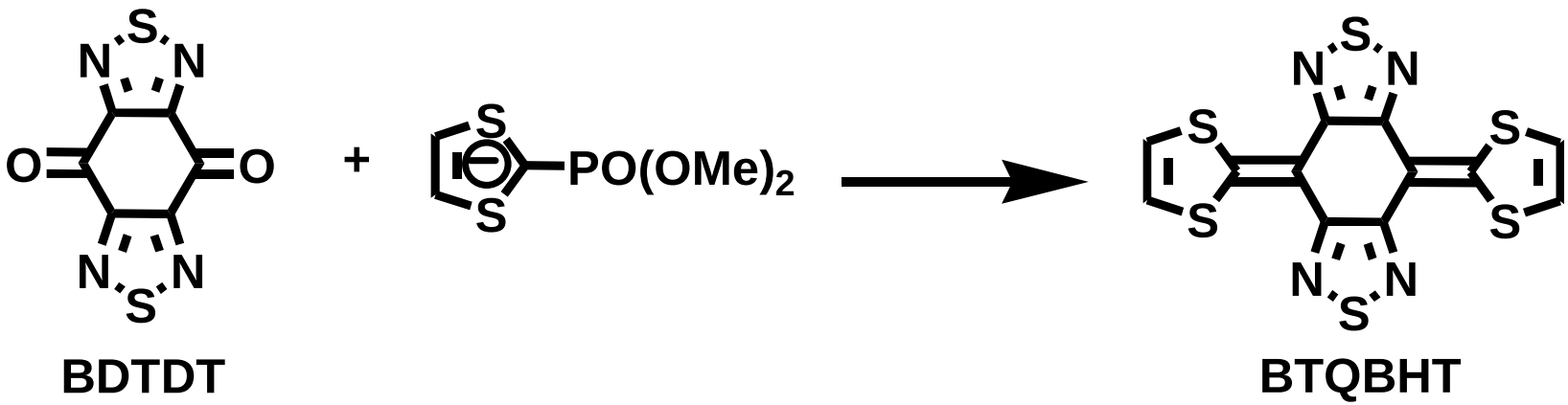


FIGURE 10.33. Synthesis and structure of BTQBHT.

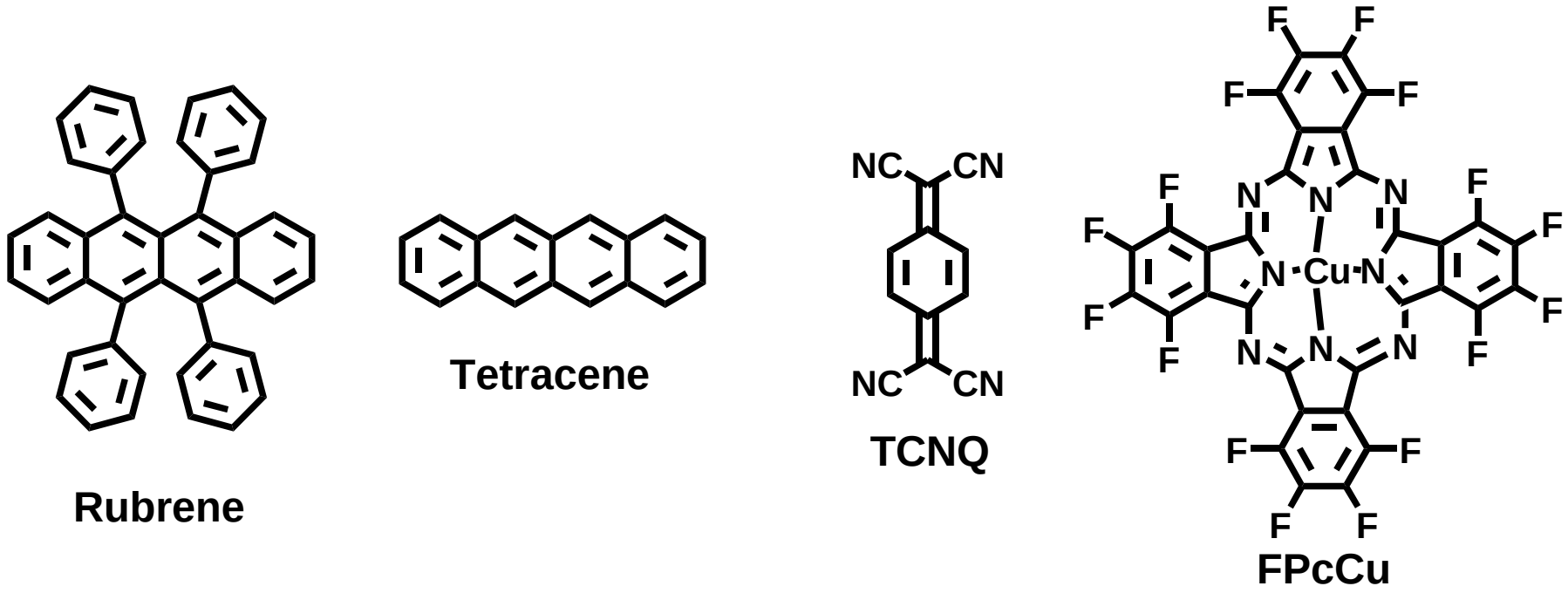


FIGURE 10.34. Chemical structure of various molecular semiconductors investigated in single crystal TFTs and their maximum carrier mobilities.

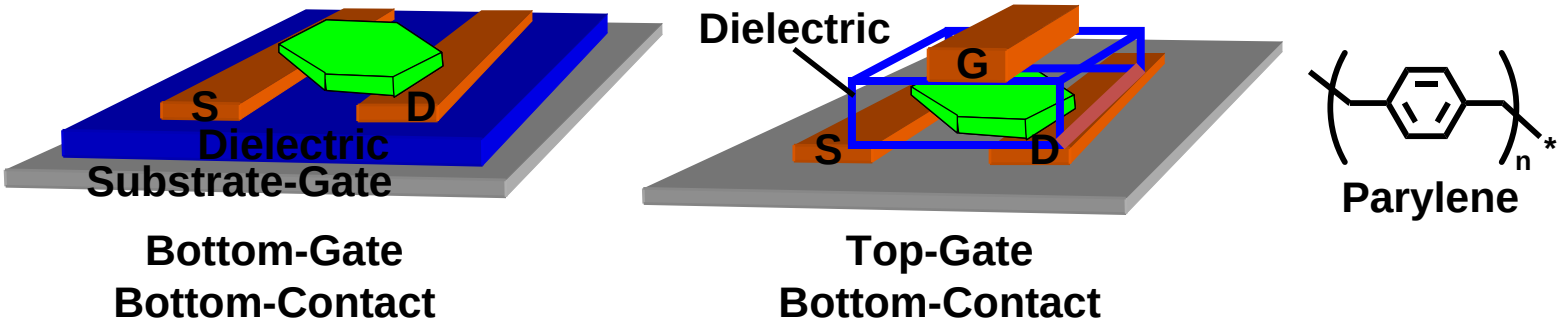


FIGURE 10.35. Bottom-gate, botom-contact and top-gate, bottom-contact SCFET configurations and chemical structure of the dielectric parylene.