Functionalized naphthalene diimide chemistry aiming at bioanalytical probe

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Naphthalene diimide (NDI) is an attractive molecule with an electron-deficient planar structure and reversible redox activity that is being explored as an n-type semiconductor material for use in flexible displays and field-effect transistors (FETs). We have focused on the unique binding mode of NDI to double-stranded DNA to develop its application as a biomaterial, and the applications to DNA analysis, functionalized DNA, and controlled supramolecular polymers have been enabled by functionalized NDI (Figure 1). In particular, we have pioneered the application of ferrocenyl NDI (FND), which is linked to electrochemically active ferrocenes, to gene electrochemical detection systems. This system enables precise analysis of genes, such as SNP detection, and has realized electrochemical DNA chips.

We also discovered that NDI forms a stable complex with G-quadruplex (G4) DNA through the stacking interaction between G-quartet and NDI planes, and realized a highly sensitive cancer diagnosis system and the creation of a new anti-cancer drug. This discovery led to the creation of a highly sensitive cancer diagnostic system and a new anti-cancer drug. These contents are summarized in the review articles or book [1-3]. Recently, we have successfully detected SERS-CoV-2 using electrochemical NDI. Here, I will outline the latest results in the bioanalytical application.

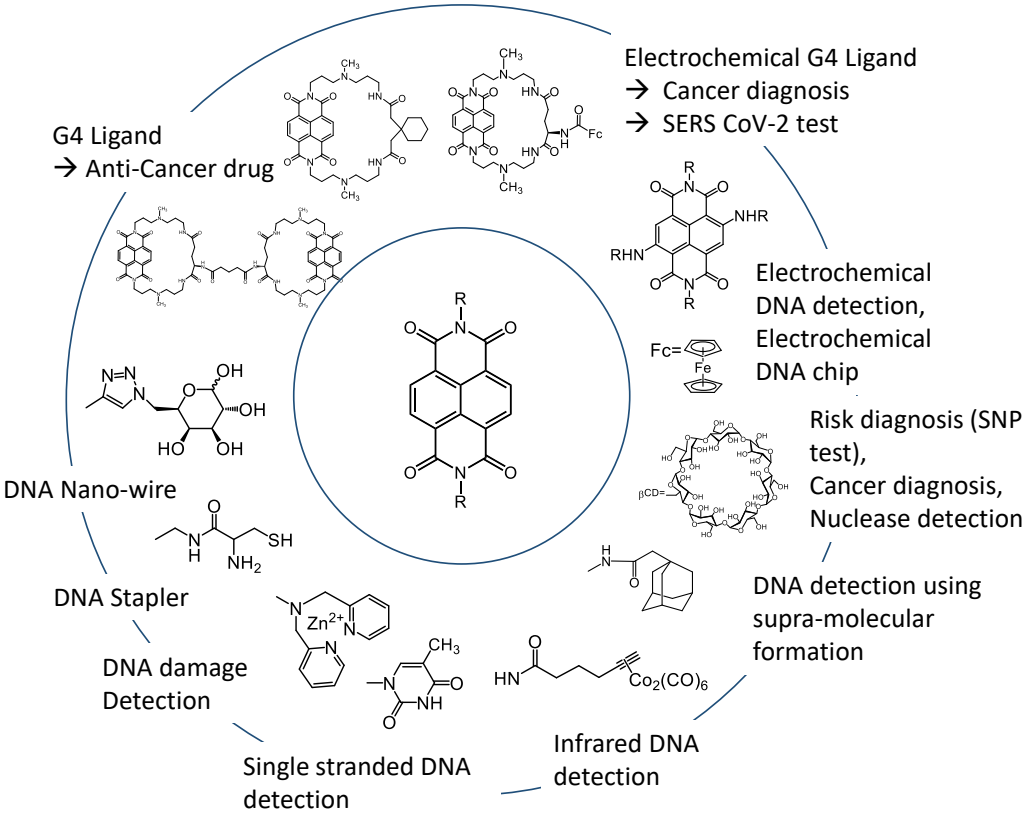

Figure 1. Functionalized naphthalene diimide for bioanalytical applications

REFERENCES

1) S. Takenaka, *Polymer Journal*, **2020**, *53*, 415-427.
2) S. Takenaka, *Analytical Sciences*, **2021**, *37*, 9-15.
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