Metal-mediated aggregation of DNA comprising 2,2’-bipyridine nucleoside, an asymmetrically substituted chiral bidentate ligand

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Electronic Supplementary Information
Titration of 5-methyl-2,2'-bipyridine nucleoside with FeSO$_4$ in MeOH as followed by UV spectroscopy. a) UV spectra upon the addition of 0.00 – 0.35 equiv. of iron(II). The absorption changes are indicated by arrows. b) UV spectra upon the addition of 0.40 – 1.0 equiv. of iron(II). c) Plot of absorption at 240 nm (●) and 301 nm (●), respectively, against the amount of added iron(II). d) Job plot based on the UV absorption at 240 nm, showing a maximum at a molar fraction of 0.75. This clearly indicates the formation of a 3:1 complex between the nucleoside and the metal ion.
Titration of 5-methyl-2,2’-bipyridine nucleoside with CuCl$_2$ in MeOH as followed by UV spectroscopy. a) UV spectra upon the addition of 0.00 – 0.50 equiv. of copper(II). The absorption changes are indicated by arrows. b) UV spectra upon the addition of 0.55 – 1.00 equiv. of copper(II). c) Plot of absorption at 286 nm (●) and 302 nm (●), respectively, against the amount of added copper(II). A distinct change of slope can be observed at 0.50 equiv. of copper(II). d) Job plot based on the UV absorption at 286 nm, showing a maximum at a molar fraction of 0.67. Taken together, these data clearly indicate the formation of a 2:1 complex between the nucleoside and the metal ion.
Titration of 5-methyl-2,2'-bipyridine nucleoside with NiCl$_2$ in MeOH as followed by UV spectroscopy. a) UV spectra upon the addition of 0.00 – 0.35 equiv. of nickel(II). The absorption changes are indicated by arrows. b) UV spectra upon the addition of 0.40 – 1.00 equiv. of nickel(II). c) Plot of absorption at 240 nm (•) and 302 nm (●), respectively, against the amount of added nickel(II). A distinct change of slope can be observed at 0.33 equiv. of nickel(II). d) Job plot based on the UV absorption at 240 nm, showing a maximum at a molar fraction of 0.75. Taken together, these data clearly indicate the formation of a 3:1 complex between the nucleoside and the metal ion.
a) AFM topographic image of d(XCGCGAATTCGCG) in the presence of copper(II) (0.67 μM oligonucleotide) and b) associated height profile, indicating that the aggregate size directly depends on the oligonucleotide concentration.

a) AFM topographic image of d(XCGCGAATTCGCG) in the presence of nickel(II) (0.83 μM oligonucleotide) and b) associated height profile, indicating monolayer formation also under an increased oligonucleotide concentration.