

A general strategy for the design of DNA coding sequences applied to nanoparticles assembly

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SI-1 SEM characterization of Al nanoparticles using SEM imaging before and after DNA functionalization

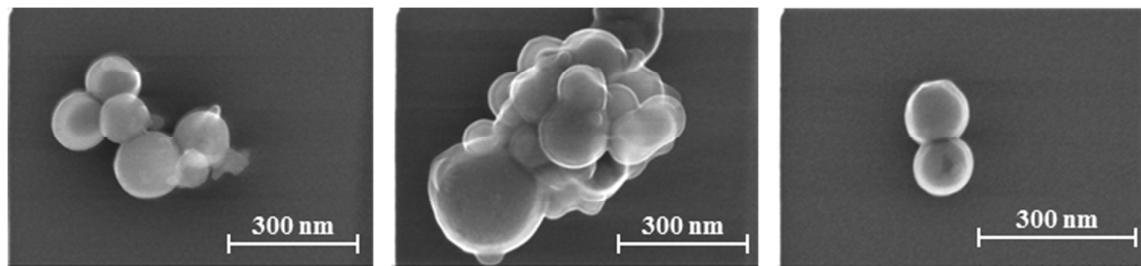


Figure SI-1a: *left and center.* SEM images of Al nanoparticles dispersed in ethanol. Al nanoparticles are characterized by a spherical shape and an alumina shell with a thickness of 2-3 nm. The nanoparticle diameters range from 50 nm to 250 nm. *Right.* Zoom on one small aggregate obtained after 8 min of sonication where we can see two nanoparticles.

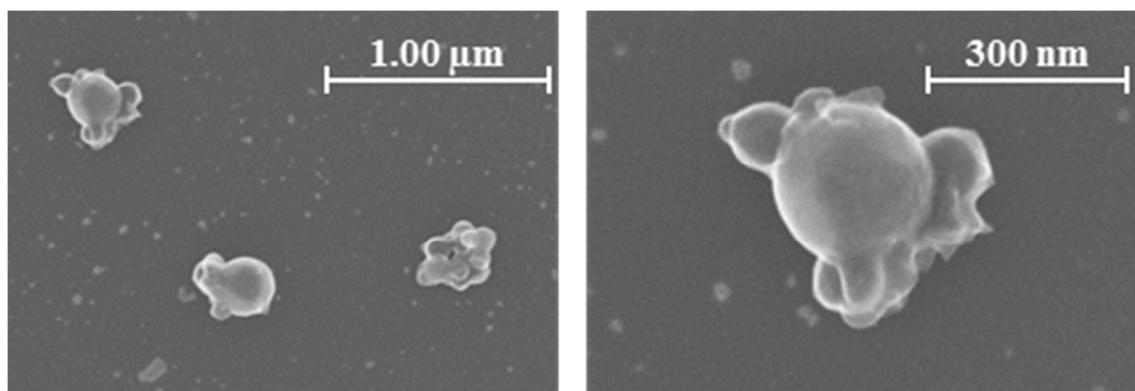


Figure SI-1b: SEM imaging of stabilized aggregates of Al nanoparticles after DNA functionalization. Aggregates of two or three nanoparticles observed before functionalization are still visible (with an approximate diameter of 250 to 300 nm) and no morphology modification is observed.

SI-2 SEM characterization of CuO nanoparticles using SEM imaging before and after DNA functionalization.

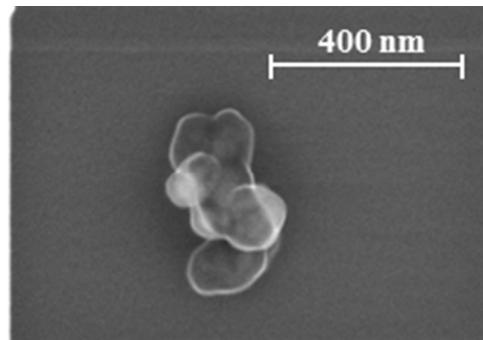


Figure SI-2a: SEM image of CuO nanoparticles dispersed in ethanol. CuO nanoparticles are highly faceted with a heterogeneous shape (~ 180 nm in diameter). Like Al nanoparticles, we observe small aggregates composed of several CuO nanoparticles after 8 min of sonication.

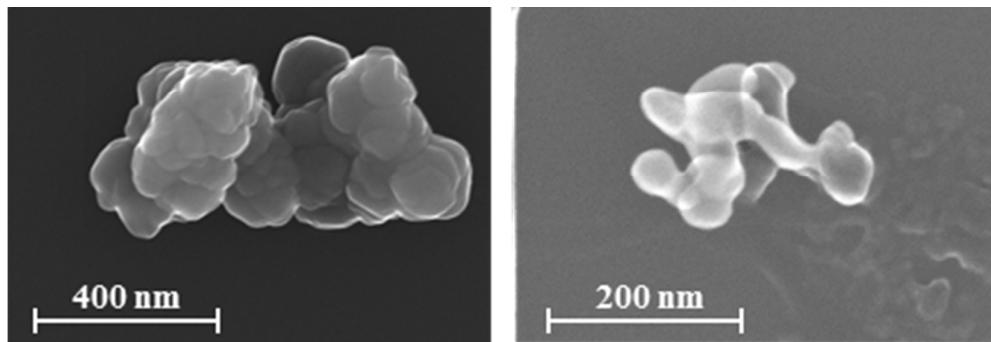


Figure SI-2b: SEM images of stabilized aggregates of DNA functionalized CuO nanoparticles. Aggregates of two or three nanoparticles observed before functionalization are still visible (with an approximate diameter of 250 to 300 nm) and no morphology modification is observed.

SI-3 DLS and zeta potential measurements of Al and CuO colloidal suspensions before and after DNA functionalization

Table SI-3: Hydrodynamic diameter and Zeta potential of Al and CuO nanoparticles dispersed in aqueous colloidal suspensions measured before and after DNA functionalization. Errors are calculated from standard deviations of three measurements on the two distinct colloidal suspensions.

Colloids	Average hydrodynamic diameter (nm)	Zeta Potential (mV)
Al	223.4 ± 7.9	-51.3 ± 1.8
Al with ss-Lit	237.8 ± 1.5	-43.5 ± 1.5
Al with ss-Opt	239.3 ± 9.7	-39.7 ± 2.4
CuO	183.9 ± 2.4	-46.8 ± 1.3
CuO with ss-Lit	223.8 ± 6.7	-42.4 ± 1.6
CuO with ss-Opt	223.6 ± 1.2	-43.0 ± 1.3

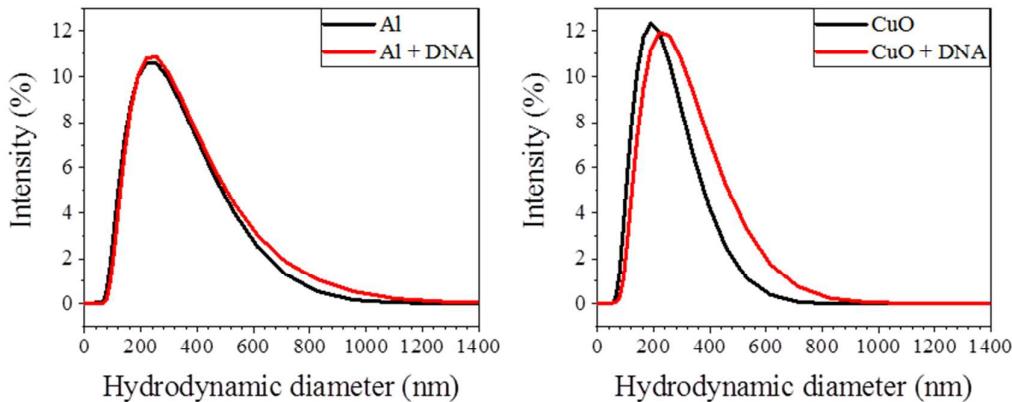


Figure SI-3: Intensity distribution as a function of the hydrodynamic diameter for (*left*) Al and, (*right*) CuO nanoparticles before (black line) and after DNA functionalization (red line). In both Al and CuO colloidal suspension, we observe a slight shift of the peak after the functionalization.

Initially and before functionalization, the suspension contains small aggregates of a few nanoparticles. Then, sonication breaks aggregates and allows for a significant reduction of the hydrodynamic diameter to reach 185 nm and 220 nm for CuO and Al respectively. After functionalization, the increase of the average hydrodynamic diameters is 20 to 35 nm for Al and CuO nanoparticles respectively. This gain corresponds perfectly to the size of oligonucleotides (30 bases long) plus the proteins grafted onto the nanoparticles. However, the higher increase observed for CuO nanoparticles is explained by the heterogeneous shape of nanoparticles.

SI-4 Details of the computational algorithm

In the following, we give an example of extending a given sequence of length L to L+1, taking into account STS and PH constraints, with MNb = 3, implying thus “compatibility tensors” of rank 3. Assuming that we are dealing at one of the nodes of length 12, preceded by 6 thymine bases as spacer, namely the sequence: TTTTTT - AGC GGG TGC CTT. In the absence of any constraint, the four A, C, G and T bases can be invariably added to the sequence. The imposed constraints may exclude some of these possibilities, according to “compatibility tensors” to be built. Since both tensors are exclusive and have the same rank, they can be merged together, into a unique rank 3 tensor. A tensor of rank 3 and dimension 4, whose 64 elements are represented by three indices, can be split into four (4×4) matrices on a 2D sheet (see scheme 1). The first index indicates which matrix should be considered, the second and third indices are respectively the row and the column of the corresponding matrix. At this starting point, all tensor elements are set to “0”.

A	C	G	T
A	A C G T	A C G T	A C G T
A	0 0 0 0	0 0 0 0	0 0 0 0
C	0 0 0 0	0 0 0 0	0 0 0 0
G	0 0 0 0	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 0	0 0 0 0

G	T	
G	G C A T	G C A T
G	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 0

Scheme 1

The spacer sequence of repeated T implies that the sequences AAA and TTT are forbidden, due to STS and PH constraints, respectively. The corresponding tensor elements are set to “1” (see Scheme 2)

A	C	G	T
A	A C G T	A C G T	A C G T
A	1 0 0 0	0 0 0 0	0 0 0 0
C	0 0 0 0	0 0 0 0	0 0 0 0
G	0 0 0 0	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 0	0 0 0 0

G	T	
G	G C A T	G C A T
G	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 0
T	0 0 0 0	0 0 0 1

Scheme 2

We then move to the first nucleotide in the actual sequence: A, excluding the sequence TTA of the last three bases (PH) and its complementary TAA (STS), leading to the new tensor of Scheme 3.

A	C	G	T	
A	1	0	0	0
C	0	0	0	0
G	0	0	0	0
T	0	0	0	0

C	A	C	G	T
A	0	0	0	0
C	0	0	0	0
G	0	0	0	0
T	0	0	0	0

G	A	C	G	T
A	0	0	0	0
C	0	0	0	0
G	0	0	0	0
T	0	0	0	0

T	A	C	G	T
A	1	0	0	0
C	0	0	0	0
G	0	0	0	0
T	1	0	0	1

Scheme 3

The next nucleotide is G, excluding TAG and its complementary CTA, and leading to the tensor of Scheme 4.

A	C	G	T	
A	1	0	0	0
C	0	0	0	0
G	0	0	0	0
T	0	0	0	0

C	A	C	G	T
A	0	0	0	0
C	0	0	0	0
G	0	0	0	0
T	1	0	0	0

G	A	C	G	T
A	0	0	0	0
C	0	0	0	0
G	0	0	0	0
T	0	0	0	0

T	A	C	G	T
A	0	1	1	0
C	0	0	0	0
G	0	1	1	0
T	1	0	0	1

Scheme 4

Following this process, we successively exclude AGC, GCG, CGG, GGG, GGT, GTG, TGC, GCC, CCT, CTT, and their respective complementary bases GCT, CGC, CCG, CCC, ACC, CAC, GCA, GGC, AGG and AAG, leading to the tensor of Scheme 5.

A	C	G	T	
A	1	0	1	0
C	0	1	0	0
G	0	1	1	0
T	0	0	0	0

C	A	C	G	T
A	0	1	0	0
C	0	1	1	1
G	0	1	1	0
T	0	0	0	1

G	A	C	G	T
A	0	0	0	0
C	1	1	1	1
G	0	1	1	1
T	0	0	1	0

T	A	C	G	T
A	1	0	0	0
C	0	0	0	0
G	0	1	0	0
T	1	0	0	1

Scheme 5

At this stage, the merged “compatibility tensors” are completed. We are now looking for the new bases X, out of the four possible nucleotides, which can extend the sequence to length 13. The considered triplet being TTX, we examine the row T in the matrix labeled T. In this row, the two columns A and T are already forbidden, but the remaining two columns C and G are still free (see Scheme 6). Therefore, the new basis X can be either C or G.

A

	A	C	G	T
A	1	0	1	0
C	0	1	0	0
G	0	1	1	0
T	0	0	0	1

C

	A	C	G	T
A	0	1	0	0
C	0	1	1	1
G	0	1	1	0
T	0	0	0	1

G

	A	C	G	T
A	0	0	0	0
C	1	1	1	1
G	0	1	1	1
T	0	0	1	0

T

	A	C	G	T
A	1	0	0	0
C	0	0	0	0
G	0	1	0	0
T	1	0	0	1

Scheme 6

SI-5 Best sequences resulting from a ranking procedure based on melting temperatures with repeated thymine spacer

Table SI-5: Ten best sequences, from 4 to 31 bases, resulting from a ranking procedure based on melting temperatures. The proposed sequences take into account a spacer composed of seven repeated thymine bases.

Number of bases	Sequence	Melting temperature
4	GCG A	1
	GCG G	1
	GCG T	1
	CGC A	1
	CGC C	1
	CGC T	1
	CCG C	-8
	CCG T	-8
	CGG C	-8
	CGG T	-8
5	CCG CA	28
	CCG CT	28
	GCC GA	28
	GCC GT	28
	GCG GA	28
	GCG GT	28
	GGC GA	28
	GGC GT	28
	CGC CA	28
	CGC CT	28
6	CCG CAC	42
	CCG CAG	42
	CCG CAT	42
	CGC CAC	42
	CGC CAG	42
	CGC CAT	42
	CGG CAC	42
	CGG CAG	42
	CGG CAT	42
	ACC GCA	42
7	ACC GCA G	52
	ACC GCA T	52
	ACG CCA G	52
	ACG CCA T	52
	ACG GCA G	52
	ACG GCA T	52
	CAC CGC T	52
	CAC GCC T	52
	CAC GGC T	52
	CCA CGC T	52
8	ACG CAG GA	58
	ACG CTG GA	58
	AGC CGT GA	58
	AGC GGT GA	58
	AGC GTG GA	58
	AGG CGT GA	58
	CAG CCG TA	58
	CAG CGG TA	58
	CAG GCG TA	58
	CCA GCG TA	58
9*	ACA GCC GAT	64

	ACA GCG GAT	64
	ACA GGC GAT	64
	ACC AGC GAT	64
	ACC GAG CAT	64
	ACC GCA GAT	64
	ACC GCT CAT	64
	ACC GCT GAT	64
	ACC TCG CAT	64
	ACC TGC GAT	64
10	CCG TGG GCG A	75
	GGC TCC CGC A	75
	AGC GTG CCG A	75
	CGG CAC GCT A	75
	AGC GGG TGC C	74
	ACG CCC AGC A	74
	ACG CCC TGC T	74
	ACG CTG GGC A	74
	AGC GTG GGC A	74
	GCC CAC GCT G	74
11	AGC GGG TGC CT	79
	AGG CAC CCG CT	79
	GGC TCC CGC AT	79
	CCG TGG GCG AT	78
	AGC GTG GGC AG	78
	ACC GAG GGC GT	78
	ACG CCC TCG GT	78
	ACG CCC TGC TA	78
	AGC AGG GCG TA	78
	AGC AGG GCG TT	78
12	AGC GGG TGC CTT	82
	ACG CCC TCG GTT	81
	CGC TCC ACG GCA	80
	GCG TGG AGC CGA	80
	GCG TGG CTC CCT	80
	GCG TGG GAG CCG	80
	GGG TGC CTC GCT	80
	CGC TTG CCC GTC	80
	ACC TTG CCC GCT	80
	ACC TTG CGG GCT	80
13	ACG GCA CCT CGC T	83
	CGC TCC ACG GCA T	83
	ACC CGC CAA GCA C	83
	AGC CGA GGT GCG T	82
	AGG GAG CCA CGC A	82
	GCG TGG CTC CCT A	82
	GCG TGG AGC CGA T	82
	ACC CGC CTT GCT C	82
	AGC GGG TGC CTT C	82
	AGC GGG TGC CTT G	82
14	ACG GCA CCT CGC TT	85
	AGC CGA GGT GCG TT	85
	CCC GCA CCT TGG CT	84
	CCG TGG GCG ATG CT	84
	GCC CAC CTG ACG CT	83
	GCG TCA GGT GGG CT	83
	GGT GTC GCA GGG CT	83
	CCG TGC GAC CAG CC	83
	ACC CGC CAA GCA CA	83
	ACC CGC CAA GCA CT	83
15	AGC GGG TGC CTT GGA	86
	ACG CCC TCG GTT GCT	86
	ACC TTG GCT CCC GCA	85

	AGC ATC GCC CAC GGA	85
	ACC CGC CAA GCA CAT	85
	AGC GGG TGC CTT CGT	85
	GCG TGA GGG CTG GTA	85
	GGT GTC GCA GGG CTT	85
	ACC CGC CAA GCA CTA	85
	AGC ACT TGG CGG GTC	85
16	ACC TTG GCT CCC GCA T	87
	ACG ATG CGG GAG CCA A	87
	AGC ATC GCC CAC GGA A	87
	AGG TTC CGT GGG CGA T	87
	AGG AGA CGC TGG GCA A	86
	ACC ACA GCG TCC CGA A	86
	GCG TTC GGG CTG TGG A	86
	GCG TTC GGG CTG TGG T	86
	GCT GTG GCG TTC GGG A	86
	GCT GTG GTT CGG GCG T	86
17	ACG ACA CCT TGC GGG CT	88
	ACG CTG TGG TTC GGG CA	88
	GCG TTC GGG CTG TGG TA	88
	ACC CTG TGC TTC CGC CA	88
	GCG TTC GGG CTG TGG AG	87
	GCT GTG GCG TTC GGG AT	87
	AGG CGG TTG CTC TGG GA	87
	CGT CTC CGC TTG CCC AT	87
	CGC TTG CCC GTC TCC AC	87
	ACC TTG GCT CCC GCA TA	87
18	ACC CTG TGC TTC CGC CAA	89
	AGG CGG TTG CTC TGG GAC	89
	ACC GCC TTC GTG TCC CAG	89
	AGG GTC TCG TTG GCG GAA	88
	ACG ATG TGC TTG GCG GGA	87
	ACG ATG TGC TTG GCG GGT	87
	ACG CTG TGG ATT GCC CGA	87
	ACC CGC CAA GCA CAT CGT	87
	CGG GAC TGC TCA ACG CCA	87
	GCC CAG TCG TGA AGC GGA	87
19	ACC CTG TGC TTC CGC CAA C	89
	ACC CTG TGC TTC CGC CAA T	89
	ACG ATG TGC TTG GCG GGT C	89
	CGG GAC TGC TCA ACG CCA T	89
	AGG CGG TTG CTC TGG GAC A	89
	GCC CAG TCG TGA AGC GGA T	88
	AGC ACT TGG CGG GTC TGT A	88
	AGG GCT TGG TGT CGC AGT T	88
	AGT GCT TGG CGG GTC TGT A	88
	ACC TTG GCT CCC GCA TCA G	88
20	AGG CGG TTG CTC TGG GAC AC	90
	AGG CGG TTG CTC TGG GAC AT	90
	ACC GCC TTC GTG TCC CAG AG	89
	ACC GCC TTC GTG TCC CAG AT	89
	ACC CTG TGC TTC CGC CAA CG	89
	ACC CTG TGC TTC CGC CAA CT	89
	ACC TGT GCT TCC GCC AAC GA	89
	GCG TCA TTC GGG CTG TGG TA	88
	ACG ATG TGC TTG GCG GGT CT	88
	CAC AGC GTC TCC TTG CCC GA	88
21	ACC CTG TGC TTC CGC CAA CGA	91
	ACC CTG TGC TTC CGC CAA CTA	90
	ACC ACA GCG TCT CCT TGC CCG	90
	AGG CGG TTG CTC TGG GAC ACG	90
	AGC ACA GGG TCT CGT TGG CGG	90

	AGC ACA GGT CTC GTT GGC GGA	90
	AGG CGG TTG CTC TGG ACA CGA	90
	AGG GTC TCG TTG GCG GAA GCA	90
	ACC TGT GCT TCC GCC AAC GAG	90
	ACG ATG TGC TTG GCG GGT CTA	90
22	ACC CTG TGC TTC CGC CAA CGA G	92
	ACC ACA GCG TCT CCT TGC CCG A	92
	AGC ACA GGG TCT CGT TGG CGG A	92
	AGG CGG TTG CTC TGG GAC ACG A	92
	ACG AGA CCC TGT GCT TCC GCC A	91
	AGG AGA CGC TGT GGT TCG GGC A	91
	ACC GCC TTC GTG TCC CAG AGC A	91
	AGG GTC TCG TTG GCG GAA GCA C	91
	ACG AGA CCT GTG CTT CCG CCA T	91
	AGC ACA GGT CTC GTT GGC GGA T	91
23	ACC ACA GCG TCT CCT TGC CCG AA	92
	AGG AGA CGC TGT GGT TCG GGC AA	92
	ACC CTG TGC TTC CGC CAA CGA GA	91
	AGG GTC TCG TTG GCG GAA GCA CA	91
	AGG TCT CGT TGG CGG AAG CAC AG	90
	ACC TGT GCT TCC GCC AAC GAG AC	90
	ACG AGA CCT GTG CTT CCG CCA TT	90
	AGC ACA GGT CTC GTT GGC GGA TT	90
	AGC CCG CAT CAC TTG GAA CGA CA	89
	AGG CGG TTG CTC TGG GAC ATT CA	89
24	AGG AGA CGC TGT GGT TCG GGC AAG	92
	AGG AGA CGC TGT GGT TCG GGC AAT	92
	ACC ACA GCG TCT CCT TGC CCG AAC	92
	ACC ACA GCG TCT CCT TGC CCG AAT	92
	ACC CTG TGC TTC CGC CAA CGA GAC	92
	ACC CTG TGC TTC CGC CAA CGA GAT	92
	AGG GTC TCG TTG GCG GAA GCA CAG	92
	AGG GTC TCG TTG GCG GAA GCA CAT	92
	AGC CCG CAT CAC TTG GAA CGA CAG	90
	ACG GGC GAT GAG TTC CAA GCA GAC	90
25	ACC ACA GCG TCT CCT TGC CCG AAC T	92
	AGG AGA CGC TGT GGT TCG GGC AAG T	92
	GGT AAG CCC GTT CAT CTG CGA CAC T	88
	CCG CCT GTG CTA ATC TCG TTG ACC C	88
	GGC GGT CTC GTA ATG TGC TTC AGG G	88
	CCT AAC GGG CTT GAT GTC GCA GAG T	88
	CGG GCA GTT GAG GAT TAC ATA GCG T	86
	GCC CGA CTT CAC CAT TAG ATA CGC T	86
	GGT AAT CTA TGC GAC ACT TCA GCC C	84
	CAC ATT ACG AGT TGG CGG TCT ATC C	83
26	GAT AGG GAC TTC GTG TAA TGC TGG CG	85
	GGT AAT CTA TGC GAC ACT TCA GCC CG	85
	CAT ACC CAG TTG CTC TAA TCG TCC GC	85
	CCT AAT GTA TCG CAG AGT TGA CGG GC	85
27	CCT AAT GTA TCG CAG AGT TGA CGG GCT	87
	GGT AAT CTA TGC GAC ACT TCA GCC CGT	87
28**	GGT AAT CTA TGC GAC ACT TCA GCC CGT T	88
	CCT AAT GTA TCG CAG AGT TGA CGG GCT T	88
29	ACA ACG ACC ATC ACT CCC GCA GCC TTC TA	93
	ACA ACG ACC ATC ACT CCC GCA GGC TTC TA	93
	ACA ACG ACC ATC ACT CCC GCC TGC TTC TA	93
	ACA ACG ACC ATC ACT CCC GCC TTC TGC TA	93
	ACA ACG ACC ATC ACT CCC GCT GCC TTC TA	93
	ACA ACG ACC ATC ACT CCC TGC CGC TTC TA	93
	ACA ACG ACC ATC ACT CCC TGC GGC TTC TA	93
	ACA ACG ACC ATC ACT CCG CAG CCC TTC TA	93
	ACA ACG ACC ATC ACT CCG CAG GGC TTC TA	93

	ACA ACG ACC ATC ACT CCG CCC TGC TTC TA	93
30	ACA ACC CGT CAC TAT GGA GCA GGC GAA GAT	92
	ACA ACC CGT CAC TAT GGA GCC TGC GAA GAT	92
	ACA ACC CGT CAC TAT GGA GGC AGC GAA GAT	92
	ACA ACC CGT CAC TAT GGA GGC TGC GAA GAT	92
	ACA ACC CGT CAC TCC ATA GCA GGC GAA GAT	92
	ACA ACC CGT CAC TCC ATA GCC TGC GAA GAT	92
	ACA ACC CGT CAC TCC ATA GGC AGC GAA GAT	92
	ACA ACC CGT CAC TCC ATA GGC TGC GAA GAT	92
	ACA ACC CGT CAC TCC TAT GCC AGC GAA GAT	92
	ACA ACC CGT CAC TCC TAT GCT GGC GAA GAT	92
31***	ACA ACC ACG ACT CCC TAT GCC GCT GAA GAT T	91
	ACA ACC ACG ACT CCC TAT GCC GCT GAA TCT T	91
	ACA ACC ACG ACT CCC TAT GCC GCT GAT TCT T	91
	ACA ACC ACG ACT CCC TAT GCG GCT GAA GAT T	91
	ACA ACC ACG ACT CCC TAT GCG GCT GAA TCT T	91
	ACA ACC ACG ACT CCC TAT GCG GCT GAT TCT T	91
	ACA ACC ACG ACT CCC TGC CGC TAT CAT TCT T	91
	ACA ACC ACG ACT CCC TGC CGC TAT CTT CAT T	91
	ACA ACC ACG ACT CCC TGC CGC TAT GAA GAT T	91
	ACA ACC ACG ACT CCC TGC CGC TAT GAA TCT T	91

* from 4 to 9 bases, sequences emanate from calculations presented in Figure 3, STS, PH

** from 10 to 28 bases, sequences emanate from calculations presented in Figure 4, lower graph, STS, PH and mismatched.

***from 29 to 31 bases, sequences emanate from calculations presented in Figure 4, top graph, STS, PH.

SI-6 Best sequences resulting from a ranking procedure based on melting temperatures without spacer

Table SI-6: Ten best sequences, from 4 to 34 bases, resulting from a ranking procedure based on melting temperatures considering sequences without spacer.

Number of bases	Sequence	Melting temperature
4	GCG A	1
	GCG G	1
	GCG T	1
	CGC A	1
	CGC C	1
	CGC T	1
	CCG A	-8
	CCG C	-8
	CCG T	-8
	CGG A	-8
5	CCG CA	28
	CCG CC	28
	CCG CT	28
	GCC GA	28
	GCC GT	28
	GCG GA	28
	GCG GG	28
	GCG GT	28
	GGC GA	28
	GGC GG	28
6	CCC GCA	46
	CCC GCC	46
	CCC GCT	46
	CCG CCA	46
	CCG CCC	46
	CCG CCT	46
	GCG GGA	46
	GCG GGC	46
	GCG GGT	46
	GGC GGA	46
7	GCC CGC A	60
	GCC CGC T	60
	GCG GGC A	60
	GCG GGC T	60
	CGC CCG A	59
	CGC CCG T	59
	CGG GCG A	59
	CGG GCG T	59
	CCC GCC A	58
	CCC GCC T	58
8	GCC CGC AA	67
	GCC CGC AT	67
	GCG GGC AA	67
	GCG GGC AT	67
	TGC CCG CT	67
	TGC GGG CT	67
	AGC CCG CA	66
	AGC GGG CA	66
	GCC CGC TA	66
	GCC CGC TT	66
9	AGC CCG CAA	72
	AGC CCG CAT	72

	AGC GGG CAA	72
	AGC GGG CAT	72
	TGC CCG CTA	72
	TGC CCG CTT	72
	TGC GGG CTA	72
	TGC GGG CTT	72
	ACC CGC CAA	71
	ACC CGC CAT	71
10	GCG GGT GCC T	76
	GGC ACC CGC T	76
	CCG TGG GCG A	75
	CGC CCA CGG A	75
	GGC TCC CGC A	75
	GCG GGA GCC A	75
	TGC CCA CGC T	75
	GCG TGG GCA A	75
	GCG TGG GCA G	75
	AGC CGT GCG A	75
11	AGC GGG TGC CT	79
	AGG CAC CCG CT	79
	GCG GGT GCC TA	79
	GCG GGT GCC TT	79
	GGC ACC CGC TA	79
	GGC ACC CGC TT	79
	GCG GGA GCC AA	79
	GCG GGA GCC AT	79
	GGC TCC CGC AA	79
	GGC TCC CGC AT	79
12	AGC GGG TGC CTA	82
	AGC GGG TGC CTT	82
	AGG CAC CCG CTA	82
	TGC GGG AGC CAA	82
	TGC GGG AGC CAT	82
	TGG CTC CCG CAT	82
	ACG CCC TCG GTA	81
	ACG CCC TCG GTT	81
	ACC GAG GGC GTA	81
	TCC GTG GGC GAT	81
13	GCG GTC GTG CCT A	83
	GCG GTC GTG CCT T	83
	ACG CAC CTC GGC T	83
	ACG GCA CCT CGC T	83
	GCC CGA CAG CGT A	83
	GCC CGA CTG CGT T	83
	GCC GAG GTG CGT T	83
	GCG AGG TGC CGT A	83
	GCG AGG TGC CGT T	83
	CGC CAG CAC GGA A	83
14	AGC GAG GCA CCC AT	85
	TGC GTG GCT CCC TA	85
	ACG CAC CTC GGC TA	85
	ACG GCA CCT CGC TT	85
	AGC CGA GGT GCG TT	85
	AGC GAG GTG CCG TA	85
	TCG CTC CAC GGC AT	85
	TCG GCT CCA CGC AA	85
	TGC CGT GGA GCG AA	85
	TGC GTG GAG CCG AT	85
15	CGG TGT CGC AGG GCT	86
	GCC ACA GCG TCC CGA	86
	AGC CAA GGT GCG GGA	86
	AGC GGG TGC CTT GGA	86

	CCA AGG CAC CCG CTA	86
	CCG AGC CAC CTG CGT	86
	CCG TGC CTC CAG CGA	86
	GCC AAG GTG CGG GAT	86
	GCC TTG GTG CGG GAT	86
	TCC AAG GCA CCC GCT	86
16	CCG AGC CAC CTG CGT T	88
	CGG TGT CGC AGG GCT T	88
	GGC TCG GTG GAC GCA A	88
	GCC ACA GCG TCC CGA A	88
	ACC TTG GCT CCC GCA T	87
	TCC AAG GCA CCC GCT A	87
	ACG AAG GCA CCC GCT A	87
	AGC AAC CGA GGG CGT A	87
	GGC ACG GAG GTC GCT T	87
	GCC TCT GCG ACC CGT T	87
17	GGC TTG CGG GAC ACC AT	88
	ACG ACA CCT TGC GGG CT	88
	ACG CTG TGG TTC GGG CA	88
	ACG GGC TTG GTG TCG CA	88
	GCC AAG TGC GGG TCG TT	88
	GCC CGA ACC ACA GGG TC	88
	GCG ACA CCA AGC CCG TA	88
	GCG ACA CCA AGC CCG TT	88
	GCG TTC GGG CTG TGG TA	88
	GGC ACA AGC GAC CCG TA	88
18	ACG CTG TGG TTC GGG CAA	89
	TGC CCG AAC CAC AGC GTC	89
	TGC GAC ACC AAG CCC GTT	89
	ACG GGC TTG GTG TCG CAG	89
	ACC CTG TGC TTC CGC CAA	89
	TGG CGG AAG CAC AGG GTC	89
	ACG CAA CAG GGA GCC GAT	89
	AGC GAA GAC CCA CGG CAT	89
	TCG CTT CTG GGT GCC GTA	89
	TGC GTT GTC CCT CGG CTA	89
19	ACG GGC TTG GTG TCG CAG A	89
	CGG GCA AGA CGC TGT GGT T	89
	CTG CGA CAC CAA GCC CGT T	89
	CGG GCT TGG TGT CGC AGT A	89
	CGG GCT TGG TGT CGC AGT T	89
	ACG CTG TGG TTC GGG CAA G	89
	ACG CTG TGG TTC GGG CAA T	89
	TGC GAC ACC AAG CCC GTT A	89
	TGC GAC ACC AAG CCC GTT C	89
	TTG CCC GAA CCA CAG CGT C	89
20	ACG GGC TTG GTG TCG CAG AA	90
	ACG GGC TTG GTG TCG CAG AG	90
	ACG GGC TTG GTG TCG CAG AT	90
	AGA CGC TGT GGT TCG GGC AA	90
	TCT GCG ACA CCA AGC CCG TT	90
	TGC CCG AAC CAC AGC GTC TA	90
	TGC CCG AAC CAC AGC GTC TC	90
	TGC CCG AAC CAC AGC GTC TT	90
	AGA CCC TGT GCT TCC GCC AA	90
	AGG CGG TTG CTC TGG GAC AC	90
21	ACG CTG TGG TTC GGG CAA GGA	91
	ACC CTG TGC TTC CGC CAA CGA	91
	ACG CCC GAA CCT TGC TGT GGA	91
	CCT TGC CGG AAC CAC AGC GTC	91
	CGT TGG CGG AAG CAC AGG GTC	91
	CGT GTC CCA GAG CAA CCG CCT	90

	GCA CAG GGT CTC GTT GGC GGA	90
	CCG CCA ACG AGA CCC TGT GCT	90
	GCA ACC GCC TTC GTG TCC CAG	90
	GGA ACG GGC TTG GTG TCG CAG	90
22	ACC CTG TGC TTC CGC CAA CGA G	92
	ACG CTG TGG TTC GGG CAA GGA G	92
	AGG AAC GGG CTT GGT GTC GCA G	92
	TCC TTG CCC GAA CCA CAG CGT C	92
	TCG TTG GCG GAA GCA CAG GGT C	92
	TGC GAC ACC AAG CCC GTT CCT C	92
	TGG GAC ACG AAG GCG GTT GCT C	92
	AGC AAC CGC CTT CGT GTC CCA G	92
	ACC ACA GCG TCT CCT TGC CCG A	92
	AGC ACA GGG TCT CGT TGG CGG A	92
23	ACG AGA CCC TGT GCT TCC GCC AA	92
	ACC ACA GCG TCT CCT TGC CCG AA	92
	ACC GCC TTC GTG TCC CAG AGC AA	92
	ACG GGC TTG GTG TCG CAG AGG AA	92
	AGC ACA GGG TCT CGT TGG CGG AA	92
	AGC CCG TTC CTC TGC GAC ACC AA	92
	AGG AGA CGC TGT GGT TCG GGC AA	92
	AGG CGG TTG CTC TGG GAC ACG AA	92
	TCC GCC AAC GAG ACC CTG TGC TT	92
	TCC TCT GCG ACA CCA AGC CCG TT	92
24	AAC GAG ACC CTG TGC TTC CGC CAA	92
	AAG GAG ACG CTG TGG TTC GGG CAA	92
	ACG AGA CCC TGT GCT TCC GCC AAC	92
	ACG AGA CCC TGT GCT TCC GCC AAT	92
	AGG AGA CGC TGT GGT TCG GGC AAG	92
	AGG AGA CGC TGT GGT TCG GGC AAT	92
	TCG TGT CCC AGA GCA ACC GCC TTA	92
	TCG TGT CCC AGA GCA ACC GCC TTC	92
	TGG TGT CGC AGA GGA ACG GGC TTA	92
	TGG TGT CGC AGA GGA ACG GGC TTG	92
25	ACC ACA GCG TCT CCT TGC CCG AAC T	92
	ACG AGA CCC TGT GCT TCC GCC AAC T	92
	ACT TCG TGT CCC AGA GCA ACC GCC T	92
	ACT TGG TGT CGC AGA GGA ACG GGC T	92
	ACC GCC TTC GTG TCC CAG AGC AAC T	92
	ACG GGC TTG GTG TCG CAG AGG AAC T	92
	ACT TCC GCC AAC GAG ACC CTG TGC T	92
	ACT TGC CCG AAC CAC AGC GTC TCC T	92
	GCA CAG GGT CTC GTT GGC GGA AGT A	92
	GCC CGT TCC TCT GCG ACT TGG TGT A	92
26	AAC GAG ACC CTG TGC TTC CGC CAA TA	91
	AAG GAG ACG CTG TGG TTC GGG CAA TA	91
	ATT CCT CTG CGA CAC CAA GCC CGT TA	91
	ATT CGT GTC CCA GAG CAA CCG CCT TA	91
	ATT GCT CTG GGA CAC GAA GGC GGT TA	91
	ATT GGT GTC GCA GAG GAA CGG GCT TA	91
	AAC CAC AGC GTC TCC TTG CCC GAA TA	91
	AAC CGC CTT CGT GTC CCA GAG CAA TA	91
	AAC GGG CTT GGT GTC GCA GAG GAA TA	91
	AAG CAC AGG GTC TCG TTG GCG GAA TA	91
27	ACT CCA CAA GAC GGG CAT TTC GCT GAT	90
	AGT GGA GAA CAG CCC GAT TTG CGT CAT	90
	TCA GCG AAA TGC CCG TCT TGT GGA GTA	90
	TGA CGC AAA TCG GGC TGT TCT CCA CTA	90
	GGG ACT TCG TGT AAT GCT CTG GCG GTT	90
	GTC TCG GTT CCA CAT TAG CAG GGC GTA	90
	GCT CGT AAA GTG TCC CAT CAG GCG GTT	90
	CAG AGC CAA GGT GTA ATC GTC CCG CAT	90

	CCC TGA AGC ACA TTA CGA GAC CGC CAA	90
	CGA GCA TTT CAC AGG GTA GTC CGC CAA	90
28	ACC GCC AAC TCG TAA TGT GCT TCA GGG A	90
	AGC GGG TCG TAA ACT GAT GTG CCT TGG A	90
	AGG TTC CGT GTA GTC AAA TGC TGG GCG A	90
	CCA AGG CAC ATC AGT TTA CGA CCC GCT A	90
	CCC TGA AGC ACA TTA CGA GTT GGC GGT C	90
	CGC CCA GCA TTT GAC TAC ACG GAA CCT C	90
	GCG GGT CGT AAA CTG ATG TGC CTT GGA G	90
	GGG ACT TCG TGT AAT GCT CAA CCG CCA G	90
	GGT TCC GTG TAG TCA AAT GCT GGG CGA T	90
	TCC AAG GCA CAT CAG TTT ACG ACC CGC T	90
29	ACC GCC AAC TCG TAA TGT GCT TCA GGG AT	91
	AGC GGG TCG TAA ACT GAT GTG CCT TGG AG	91
	AGG GAC TTC GTG TAA TGC TCA ACC GCC AG	91
	AGG TTC CGT GTA GTC AAA TGC TGG GCG AT	91
	TCC AAG GCA CAT CAG TTT ACG ACC CGC TA	91
	TCC CTG AAG CAC ATT ACG AGT TGG CGG TC	91
	TCG CCC AGC ATT TGA CTA CAC GGA ACC TC	91
	TGG CGG TTG AGC ATT ACA CGA AGT CCC TA	91
	TCA TCT CGG TTC CAC AAT ACG CCC TGC TA	91
	TGA TGT GCC TTG GAG AAT AGC GGG TCG TA	91
30	AGA CCG CCA ACT CGT AAT GTG CTT CAG GGA	91
	AGA GGT TCC GTG TAG TCA AAT GCT GGG CGA	91
	AGC GGG TCG TAA ACT GAT GTG CCT TGG AGA	91
	AGG GAC TTC GTG TAA TGC TCA ACC GCC AGA	91
	CCC TGA AGC ACA TTA CGA GTT GGC GGT CTA	91
	CGC CCA GCA TTT GAC TAC ACG GAA CCT CTT	91
	CTC CAA GGC ACA TCA GTT TAC GAC CCG CTA	91
	CTG GCG GTT GAG CAT TAC ACG AAG TCC CTA	91
	GAC CGC CAA CTC GTA ATG TGC TTC AGG GAT	91
	GAG GTT CCG TGT AGT CAA ATG CTG GGC GAT	91
31	ACA CCT TGG CTC TAC TGA AAT CGT CCC GCA T	91
	ACA GGC GGA AGT GCT AAT CTC GTT GAC CCA T	91
	ACC CAG TTG CTC TAA TCG TGA AGG CGG ACA T	91
	AGA CCG CCA ACT CGT AAT GTG CTT CAG GGA T	91
	AGA GGT TCC GTG TAG TCA AAT GCT GGG CGA T	91
	AGC GGG TCG TAA ACT GAT GTG CCT TGG AGA A	91
	AGG GAC TTC GTG TAA TGC TCA ACC GCC AGA T	91
	TCC CTG AAG CAC ATT ACG AGT TGG CGG TCT A	91
	TCG CCC AGC ATT TGA CTA CAC GGA ACC TCT T	91
	TCT CCA AGG CAC ATC AGT TTA CGA CCC GCT A	91
32	AAC ACC TTG GCT CTA CTG AAA TCG TCC CGC AT	91
	AAG AGG TTC CGT GTA GTC AAA TGC TGG GCG AT	91
	ACG CCC TGC TAA AGT CAT CTC GGT TCC ACA AT	91
	AGC GGG TCG TAA ACT GAT GTG CCT TGG AGA AT	91
	TCG CCC AGC ATT TGA CTA CAC GGA ACC TCT TA	91
	TGC GGG ACG ATT TCA GTA GAG CCA AGG TGT TA	91
	TTC TCC AAG GCA CAT CAG TTT ACG ACC CGC TA	91
	TTG TGG AAC CGA GAT GAC TTT AGC AGG GCG TA	91
	AAC TGA TGT GCC TTG GAG AAT AGC GGG TCG TA	91
	AAG TCA TCT CGG TTC CAC AAT ACG CCC TGC TA	91
33	AAA CTG ATG TGC CTT GGA GAA TAG CGG GTC GTA	91
	AAA GTC ATC TCG GTT CCA CAA TAC GCC CTG CTA	91
	AAC ACC TTG GCT CTA CTG AAA TCG TCC CGC ATA	91
	AAG AGG TTC CGT GTA GTC AAA TGC TGG GCG ATA	91
	ATC GCC CAG CAT TTG ACT ACA CGG AAC CTC TTA	91
	ATG CGG GAC GAT TTC AGT AGA GCC AAG GTG TTA	91
	ATT CTC CAA GGC ACA TCA GTT TAC GAC CGG CTA	91
	ATT GTG GAA CGG AGA TGA CTT TAG CAG GGC GTA	91
	TAAG GAG GTT CGG TGT AGT CAA ATG CTG GGC GAT	90
	TAG CGG GTC GTA AAC TGA TGT GCC TTG GAG AAT	90

34	AAA TCG TCC CGC ATA ACA CCT TGG CTC TAC TGA A	90
	AAT CGT CCC GCA TAA CAC CTT GGC TCT ACT GAA A	90
	AGT CAT CTC GGT TCC ACA ATA CGC CCT GCT AAA G	90
	ATA GCG GGT CGT AAA CTG ATG TGC CTT GGA GAA T	90
	AAA CTG ATG TGC CTT GGA GAA TAG CGG GTC GTA A	90
	AAA GTC ATC TCG GTT CCA CAA TAC GCC CTG CTA A	90
	AAA TGC TGG GCG ATA AGA GGT TCC GTG TAG TCA A	90
	AAC ACC TTG GCT CTA CTG AAA TCG TCC CGC ATA A	90
	AAC TGA TGT GCC TTG GAG AAT AGC GGG TCG TAA A	90
	AAG AGG TTC CGT GTA GTC AAA TGC TGG GCG ATA A	90

SI-7 Best sequences resulting from a ranking procedure based on melting temperatures with repeated adenine spacer

Table SI-7: Ten best sequences, from 4 to 28 bases, resulting from a ranking procedure based on melting temperatures considering sequences with a spacer composed of repeated adenine bases.

Number of bases	Sequence	Melting temperature
4	GCG A	1
	GCG G	1
	CGC A	1
	CGC C	1
	CCG A	-8
	CCG C	-8
	CGG A	-8
	CGG C	-8
	CGG G	-8
5	GCC A	-8
	CCG CA	28
	CCG CC	28
	GCC GA	28
	GCC GT	28
	GCG GA	28
	GCG GG	28
	GGC GA	28
	GGC GG	28
	CGC CA	28
6	CGC CC	28
	CCC GCA	46
	CCC GCC	46
	CCC GCT	46
	CCG CCA	46
	CCG CCC	46
	CCG CCT	46
	GCG GGA	46
	GCG GGC	46
	GCG GGT	46
	GGC GGA	46
7	CCC GGC T	60
	GCG GGC T	60
	CGC CCG T	59
	CGG GCG T	59
	CCC GCC A	58
	CCC GCC T	58
	CCG CCC A	58
	CCG CCC T	58
	GGC GGG A	58
	GGC GGG T	58
8	TGC CCG CT	67
	TGC GGG CT	67
	GCC CGC TA	66
	GCG GGC TA	66
	CGC CCG TA	66
	CGG GCG TA	66
	GGC GGG TA	65
	GGC GGG TC	65
	GGG CGG TA	65
	CCC GCC AA	65
9	TGC CCG CTA	72
	TGC GGG CTA	72
	TGG CGG GTA	71

	TGG CGG GTC	71
	TGG GCG GTA	71
	TGG GCG GTT	71
	CGC ACG GCT	71
	TCG CCC GTA	71
	TCG GGC GTA	71
	GCC CAC GCT	70
10	GGC ACC CGC T	76
	CGC CCA CGG A	75
	GCG GGA GCC A	75
	TGC CCA CGC T	75
	CGC ACG GCT A	75
	TCG CAC GGC T	74
	GCC CAC GCT A	74
	GCC CAC GCT G	74
	CGC CCA GCA A	74
	TGC CCA GCG A	74
11	GGC ACC CGC TA	79
	GCG GGA GCC AA	79
	GCG GGA GCC AT	79
	TGC GGG AGC CA	79
	TGG CTC CCG CA	79
	CGC CCA CGG AA	78
	CGC CCA CGG AT	78
	TCC GTG GGC GA	78
	TCG CCC ACG GA	78
	TGC CCA CGC TA	78
12	TGC GGG AGC CAT	82
	TGG CTC CCG CAT	82
	TCC GTG GGC GAT	81
	TCG CCC ACG GAT	81
	CGC CAG CAC GGA	80
	CGG CTC CAC GCA	80
	CGG GCT GAC GCA	80
	GCC CGT CAG CGA	80
	GCC GTG GAG CGA	80
	GCC GTG GGA GCG	80
13	CGC CAG CAC GGA A	83
	CGC CAG CAC GGA T	83
	CGG CTC CAC GCA A	83
	CGG GCT GAC GCA A	83
	TGC CGT GGA GCG A	83
	TGG GTG CCT CGC T	83
	GGC GAG CAG GGT A	82
	TGC CCA CGC TGT A	82
	TCG GCT CCA CGC A	82
	GCC CGT CAG CGA A	82
14	TCG GCT CCA CGC AA	85
	TGC CGT GGA GCG AA	85
	CCA AGG CAC CCG CT	84
	CGC CCA CGG AAG CA	84
	GCG GGA GCC AAC GA	84
	GCC CAC CTG ACG CT	83
	GGC ACA GCG ACC CG	83
	GGT GTC GCA GGG CT	83
	CCG ACC AGC GTG CC	83
	GCC CAG CGA CAC GG	83
15	CCA AGG CAC CCG CTA	86
	TCC AAG GCA CCC GCT	86
	TGG TGT CGC AGG GCT	85
	TCC GTG GGC GAT GCT	85
	GCC CAC CTG ACG CTA	85

	TGG CTC CCG CAT CGT	85
	TCC CGC CAA GCA CAT	85
	TGC CGA ACC ACG CTA	85
	GGA ACC GAG GGC GTA	85
	TGG AAC CGA GGG CGT	85
16	TCC AAG GCA CCC GCT A	87
	TGG TGT CGC AGG GCT T	87
	TGG AAC CGA GGG CGT A	87
	TCG TAG CGG GTG CCT T	86
	TGC TAC GCC CTC GGT T	86
	TCC TCT GCG ACC CGT T	86
	CCC GCT CAC CAA GGC A	86
	CGC CAA GCA GAC CCG T	86
	GCG GAA CGA CAG GGC T	86
	CGC CCA GCA ATC CGT G	85
17	TGC TGT GGA ACG CCC GA	88
	TGG CGG AAG CAC AGG GT	87
	CGC CAA GCA GAC CCG TA	87
	TCC CAG AGC AAC CGC CT	87
	GCG GAA CGA CAG GGC TA	87
	TGC CCA CGC TGA AGG TT	87
	TGC TGT GGA ACG CCC TA	87
	TGG CGG AAG CAC AGG TC	87
	TGG TGA ACG CAG GGC TA	87
	TGG TGT CGC AGG GCT TA	87
18	TGG CGG AAG CAC AGG GTC	89
	TCC CAG AGC AAC CGC CTT	89
	TGG GAC ACG AAG GCG GTT	89
	TCC GCC AAC GAG ACC CTG	88
	CCC GCC AAG CAC ATC GTA	87
	CGG GCA ATC CAC AGC GTA	87
	CGG GCA ATC CAC AGC GTC	87
	CGC CAA GCA CAT CCC GTA	87
	CCA AGG CAC CCG CTA CGA	87
	CGC CCA GCA ATC CGT GAA	87
19	TGG CGG AAG CAC AGG GTC T	89
	TCC CGC CAA GCA CAT CGT A	88
	TCC CAG AGC AAC CGC CTT A	88
	TGG GAC ACG AAG GCG GTT A	88
	TGC TGT GGA ACT CGC CCT A	88
	TGG CGG AAG CAC AGG TCT A	88
	TGG CGG AAG CAC AGG TCT C	88
	TGG GCG TGA ACC TCT GCT A	88
	TGC CCA CCT GAA GCG AGT A	88
	TGC TAC ACG AAC CGC CCA G	88
20	TGG CGG AAG CAC AGG GTC TA	90
	TGG CGG AAG CAC AGG GTC TC	90
	TCC GCC AAC GAG ACC CTG TA	89
	TCC GCC AAC GAG ACC CTG TG	89
	CCT CTG CGA CAC CAA GCC CG	89
	GCC CGT CAG CGA ATG TGG TA	88
	CCC GCC AAG TGA GCA TCG TA	88
	GCC CGT CAG CGA ATG TGG AG	88
	GGT GTC GCA GAG GAA CGG GC	88
	GGG CGG AAC TCA CGA TGC TA	88
21	CCT CTG CGA CAC CAA GCC CGT	90
	GGT GTC GCA GAG GAA CGG GCT	90
	TCC GCC AAC GAG ACC TGT GCT	90
	TCG TGT CCA GAG CAA CCG CCT	90
	TCG TGT CCC AGA GCA ACC GCC	90
	TCC TCT GCG ACA CCA AGC CCG	90
	TGG CGG AAG CAC AGG GTC TCG	90

	TGC TCT GGA CAC GAA GGC GGT	90
	TGC TCT GGG ACA CGA AGG CGG	90
	TGG CGG AAG CAC AGG TCT CGT	90
22	TCG TGT CCC AGA GCA ACC GCC T	91
	TGG TGT CGC AGA GGA ACG GGC T	91
	TCC GCC AAC GAG ACC CTG TGC T	91
	TCC TCT GCG ACA CCA AGC CCG T	91
	TGC TCT GGG ACA CGA AGG CGG T	91
	TGG CGG AAG CAC AGG GTC TCG T	91
	TCG TGT CCA GAG CAA CGG CCT A	91
	TGC TCT GGA CAC GAA GGC GGT A	91
	GCC CAG TTC ACG ACA TCC GCT A	89
	GCG GAC GAG CCA ATC ACA GGT A	89
23	TCC TCT GCG ACA CCA AGC CCG TT	92
	TGG TGT CGC AGA GGA ACG GGC TT	92
	TCG TGT CCA GAG CAA CGG CCT AA	90
	TGC TCT GGA CAC GAA GGC GGT AA	90
	CCG CCA AGC ACA TCG TAG ACC CT	89
	TGG GTC ATA CAG GCG GAA GTG CT	89
	TAC ACC AAG CCC GTT CCT CTG CG	89
	TGG CGG AAG CAC AGG GTC TAA CT	89
	GGT GAA CGC AGT ATG TCG GGC TA	88
	GGC GGA ACG AGA TGC TAC AGG GT	88
24	TGG TGT CGC AGA GGA ACG GGC TTA	92
	TCC TCT GCG ACA CCA AGC CCG TTA	92
	TAC ACG AAG GCG GTT GCT CTG GGA	90
	TAC ACC AAG CCC GTT CCT CTG CGA	90
	TAG AGC AAC CGC CTT CGT GTC CCA	90
	TAG AGG AAC GGG CTT GGT GTC GCA	90
	TCA AGC CCG TTA GGT GTC GCA GAG	89
	TGA ACG GGC TTA CCT CTG CGA CAC	89
	CCA TTC GGG CAA GTA GAC GCT GTG	88
	CCC TGA ATG TGC TAC GAG ACC GCC	88
25	TAC ACC AAG CCC GTT CCT CTG CGA C	91
	TAC ACG AAG GCG GTT GCT CTG GGA C	91
	TAG AGC AAC CGC CTT CGT GTC CCA G	91
	TAG AGG AAC GGG CTT GGT GTC GCA G	91
	TAC ACG AAG TCC CAG AGC AAC CGC C	89
	TAG AGG AAC TGC GAC ACC AAG CCC G	89
	TAG AGC AAC TGG GAC ACG AAG GCG G	89
	TAC ACC AAG TCG CAG AGG AAC GGG C	89
	CCA TTC GGG CAA GTA GAC GCT GTG A	88
	CCC TGA AGC ACA TTA CGA GAC CGC C	88
26	CCC TGA AGC ACA TTA CGA GAC CGC CA	89
	GGG TCA ACG AGA TTA GCA CAG GCG GA	89
	TGG TAA GTG TCG CAG ATG AAC GGG CT	89
	TCC TAA CTC TGC GAC ATC AAG CCC GT	89
	TAG AGC AAC TGG GTA TGA AGG CGG AC	88
	TAC ACG AAG TCC CTA TCA ACC GCC AG	88
	GGA TTA CAT AGC GTC TCA ACT GCC CG	85
	GGG CAG GAT TAC ATA GCG TCT CAA CT	85
	CCA TTA GAT ACG CTG TGA AGT CGG GC	85
	CCC GAC CAT TAG ATA CGC TGT GAA GT	85
27	CCC TGA AGC ACA TTA CGA GAC CGC CAA	90
	GGG TCA ACG AGA TTA GCA CAG GCG GAA	90
	TAG AGC AAC TGG GTA TGA AGG CGG ACA	88
	TAC ACG AAG TCC CTA TCA ACC GCC AGA	88
	CCA TTA GAT ACG CTG TGA AGT CGG GCA	87
	GGA TTA CAT AGC GTC TCA ACT GCC CGA	87
28	CCA TTA GAT ACG CTG TGA AGT CGG GCA A	88
	GGA TTA CAT AGC GTC TCA ACT GCC CGA A	88

SI-8 SEM imaging of Al+CuO suspension made of naked Al and CuO nanoparticles before the functionnalization with DNA

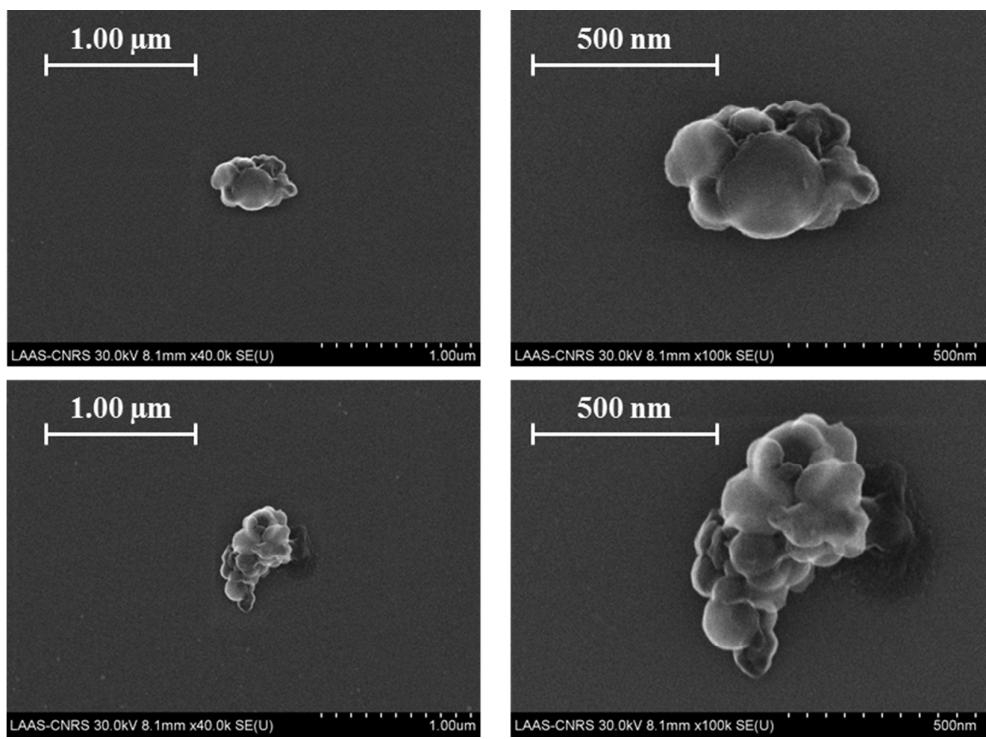


Figure SI-8: SEM images of Al and CuO nanoparticles without DNA at 35 mM; this corresponds to the black points of Figure 5. No aggregation is seen and single Al and CuO aggregates are observed.

SI-9 Detailed numerical values related to the Figure 6 of the manuscript, highlighting the aggregates' thermal stability

Table SI-9: Numerical values related to the Figure 6 of the manuscript

DNA	Heating temperature	Cycle number	Mean hydrodynamic diameter (nm)	Mean hydrodynamic diameter (nm) variation between ambient and high temperature
Optimized DNA strands (ss-Opt)	50 °C	1	760 ± 100	255
	50 °C	2	830 ± 110	230
	50 °C	3	890 ± 70	540
	70 °C	1	670 ± 55	470
	70 °C	2	460 ± 35	755
	70 °C	3	345 ± 35	835
DNA	Heating temperature	Cycle number	Mean hydrodynamic diameter (nm)	Mean hydrodynamic diameter (nm) variation between ambient and high temperature
Non-optimized DNA strands (ss-Lit)	50 °C	1	750 ± 125	360
	50 °C	2	700 ± 130	705
	50 °C	3	470 ± 130	800
	70 °C	1	690 ± 50	325
	70 °C	2	630 ± 230	645
	70 °C	3	530 ± 70	975