The Regulatory Roles of Intrinsically Disordered Linker in VRN1-DNA Phase Separation

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Supplementary material

Figure S1: Contour of ρ = 0.025 and ϕ_C = 0.5 for different neutral linker length systems with the concentration ratio of protein/DNA = 2/1.

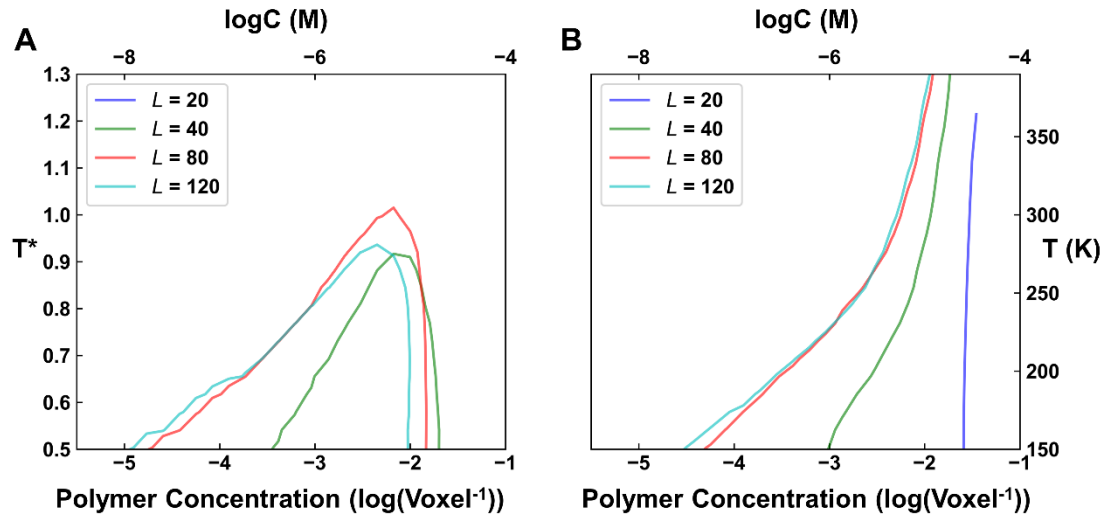Table S1: The contact energy among different components.

Figure S1. Contour of (A) $\rho = 0.025$ and (B) $\phi_C = 0.5$ for different neutral linker length systems with the number of protein : DNA = 1000 : 500.

Table S1. The contact energy among different components[a]. (unit: $k_B T_0$)

	protein bead	DNA bead	positively charged patch	negatively charged patch	+2 charged patch	+4 charged patch	+6 charged patch
protein bead	0.4	-2.0	0.7	-0.7	0.2	0.4	0.6
DNA bead	-2.0	10.0	-3.5	3.5	-1.0	-2.0	-3.0
positively charged patch[b]	0.7	-3.5	1.2	-1.2	-	-	-
negatively charged patch	-0.7	3.5	-1.2	1.2	-	-	-
+2 charged patch[c]	0.2	-1.0	-	-	0.1	-	-
+4 charged patch	0.4	-2.0	-	-	-	0.4	-
+6 charged patch	0.6	-3.0	-	-	-	-	0.9

[a]: The contact energy here is mainly determined by the electrostatic interaction between different components. The net charge of a single B3 domain in VRN1 is +4, and the net charge of a single DNA bead is -20. So the ratio of contact energy among protein bead - protein bead, protein bead – DNA bead, and DNA bead – DNA bead, is approximately 16 : -80 : 400, which is reduced to 0.4 : -2.0 : 10.0.

[b]: The charged patch that was used in experiments includes +7 or -7 charged residues, and the net charge of a positively or negatively charged patch is +7 or -7, respectively. The ratio among protein bead, DNA bead, positively charged patch, and negatively charged patch is determined as above.

[c]: The artificially constructed +2. +4, or +6 charged patch is supposed to contain +2, +4, or +6 charged residues in a single charged patch, which combines with the -2, -4 or -6 charged patch to form three systems with decreased charged residues in a single charged patch. The ratio among protein bead, DNA bead, positively charged patch, and negatively charged patch in these system is also determined as above.