Electronic Supplementary Information

Tuning properties of silver nanoclusters with RNA nanoring assemblies.

Liam Yourston[a], Lewis Rolband[b], Caroline West[b], Alexander Lushnikov[c], Kirill A. Afonin[b], and Alexey V. Krasnoslobodtsev [*,a,c]

[a] Department of Physics, University of Nebraska Omaha, Omaha, NE 68182, USA.
[b] Nanoscale Science Program, Department of Chemistry, University of North Carolina at Charlotte, Charlotte, NC 28223, USA.
[c] Nanoimaging Core Facility at the University of Nebraska Medical Center, Omaha, NE 68198, USA.
[*] Correspondence: akrasnos@unomaha.edu; Tel.: +1-402-554-3723.

Table S1. RNA strands forming the RNA rings (nrA-nrF) with 3' extensions designed to complementary bind DNA sequences with the dC_{12} template regions are shown. All sequences are listed from the 5' to 3' end.

Strand Name	**Sequence (5'-3')**
nrA	GGGAACCGUCCACUGGUUCCCGCUACGAGAGCCUGCCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
nrB	GGGAACCGCAGGCUGGUUCCCGCUACGAGAGAACGCCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
nrC	GGGAACCGCGUUCUGGUUCCCGCUACGAGACGUCUCCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
nrD	GGGAACCGAGACGUGGUUCCCGCUACGAGUCGUGGUCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
nrE	GGGAACCACCACGAGGUUCCCGCUACGAGAACCAUCCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
nrF	GGGAACCGAUGGUUGGUUCCCGCUACGAGAGUGGACCUCGUAGCUUCGGUGGUGCA GAUGAACUUCAGGGUCA
Ag-Out	CCCCCCCCCCCCACCCTGAAGTTCATCTGCACCACCG
Ag-In	ACCCTGAAGTTCATCTGCACCACCGCCCCCCCCCCCC

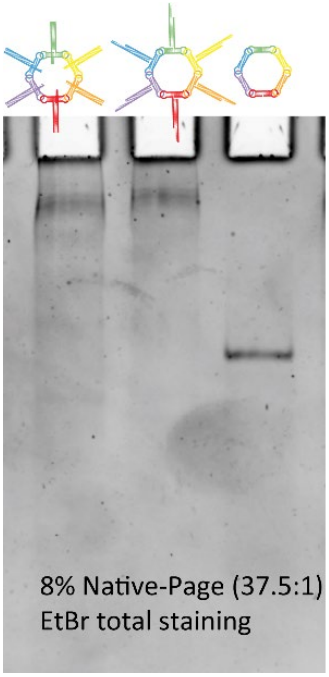

Figure S1. Using a 37.5:1 acrylamide to bis-acrylamide mixture, an 8 % non-denaturing polyacrylamide gel was used for electrophoretic mobility studies. The Ring-$dC_{12\text{-}IN}$ and Ring-$dC_{12\text{-}OUT}$ are shown in the left and middle lanes respectively. The larger size of these assemblies was confirmed by running them against a non-functionalized RNA ring control shown in the right lane. Please note the slight band shift between Ring-$dC_{12\text{-}IN}$ (left) and Ring-$dC_{12\text{-}OUT}$ (middle) due to the expanded geometry of Ring-$dC_{12\text{-}OUT}$.

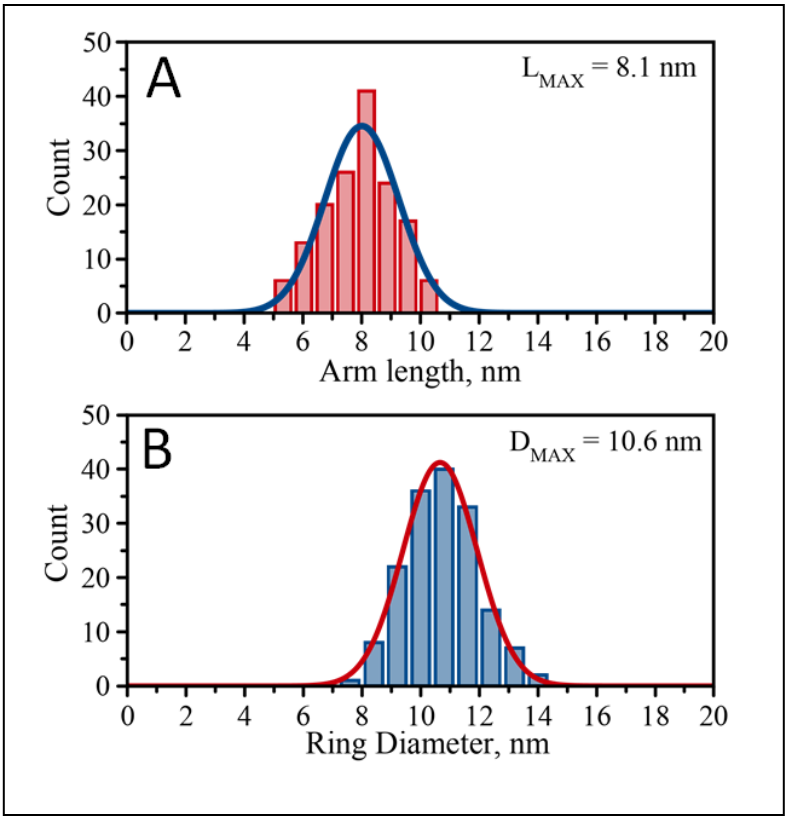

Figure S2. Shape analysis of nanoring structures imaged with Atomic Force Microscopy: A) statistical histogram of measured arm length, Gaussian fit results in most frequently observed length of 8.1 nm; B) statistical histogram of nanoring diameter, Gaussian fit results in most frequently observed diameter of 10.6 nm.

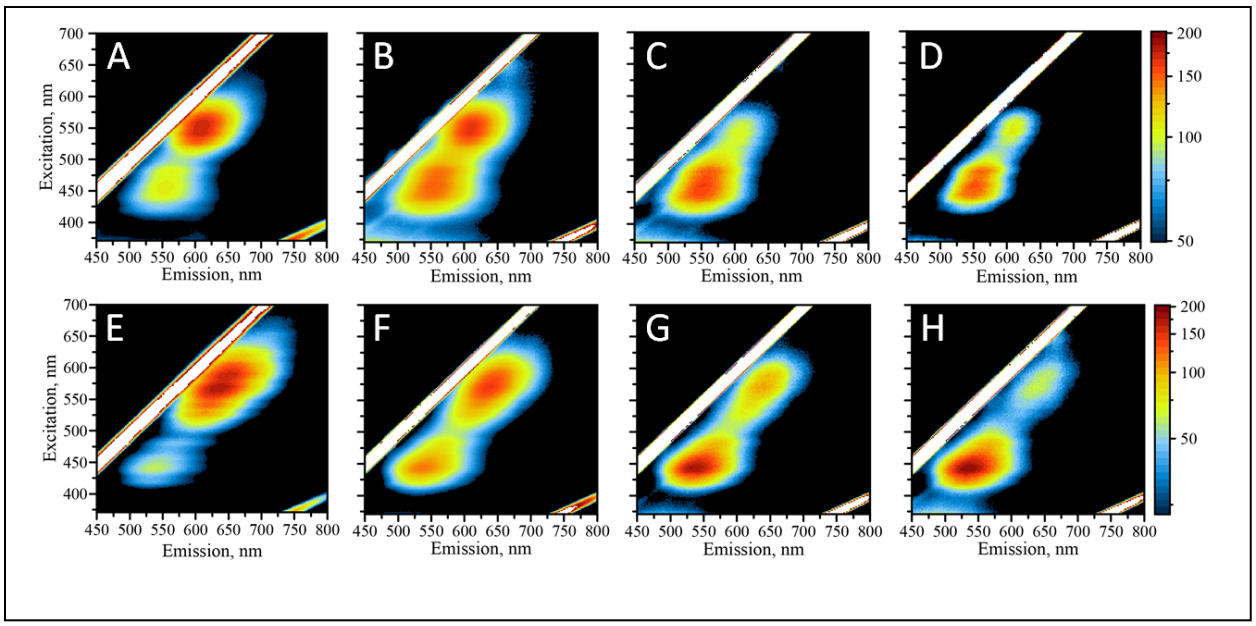

Figure S3. Time evolution of the excitation-emission matrix (EEM) for the two dumb-bell monomeric templates: (A) AgNC/dumb-bell-$dC_{12\text{-}OUT}$ at 5 days, (B) AgNC/dumb-bell-$dC_{12\text{-}OUT}$ at 12 days, (C) AgNC/dumb-bell-$dC_{12\text{-}OUT}$ at 23 days, (D) AgNC/dumb-bell-$dC_{12\text{-}OUT}$ at 33 days, (E) AgNC/dumb-bell-$dC_{12\text{-}IN}$ at 5 days, (F) AgNC/dumb-bell-$dC_{12\text{-}IN}$ at 12 days, (G) AgNC/dumb-bell-$dC_{12\text{-}IN}$ at 23 days, (H) AgNC/dumb-bell-$dC_{12\text{-}IN}$ at 33 days.

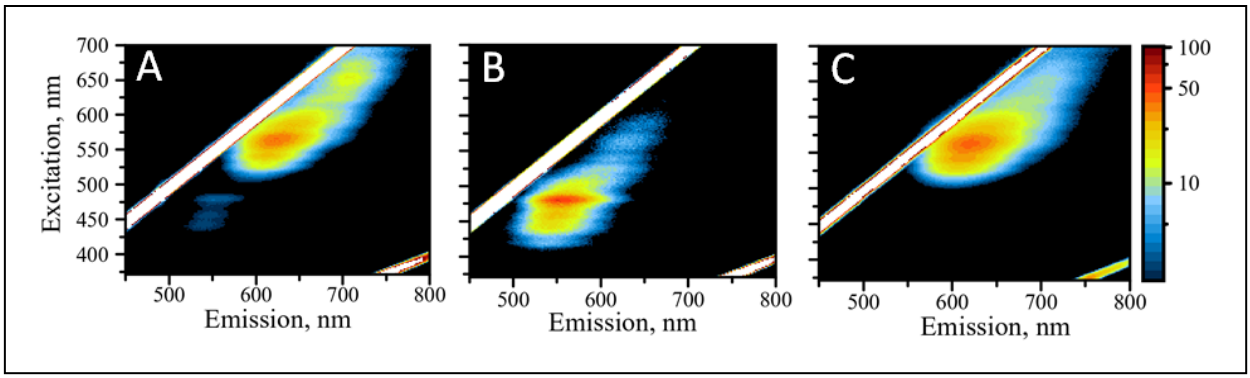

Figure S4. Reversible oxidation – reduction of AgNCs/Ring-$dC_{12\text{-}OUT}$. A) initially recorded excitation-emission map (t = 0 weeks), B) excitation-emission map of aged sample showing almost full conversion of "red" to "green" emitting nanoclusters (t = 9 weeks), C) excitation-emission map of the aged, 9-week, sample shown in (B) immediately after addition of 60 μM $NaBH_4$.

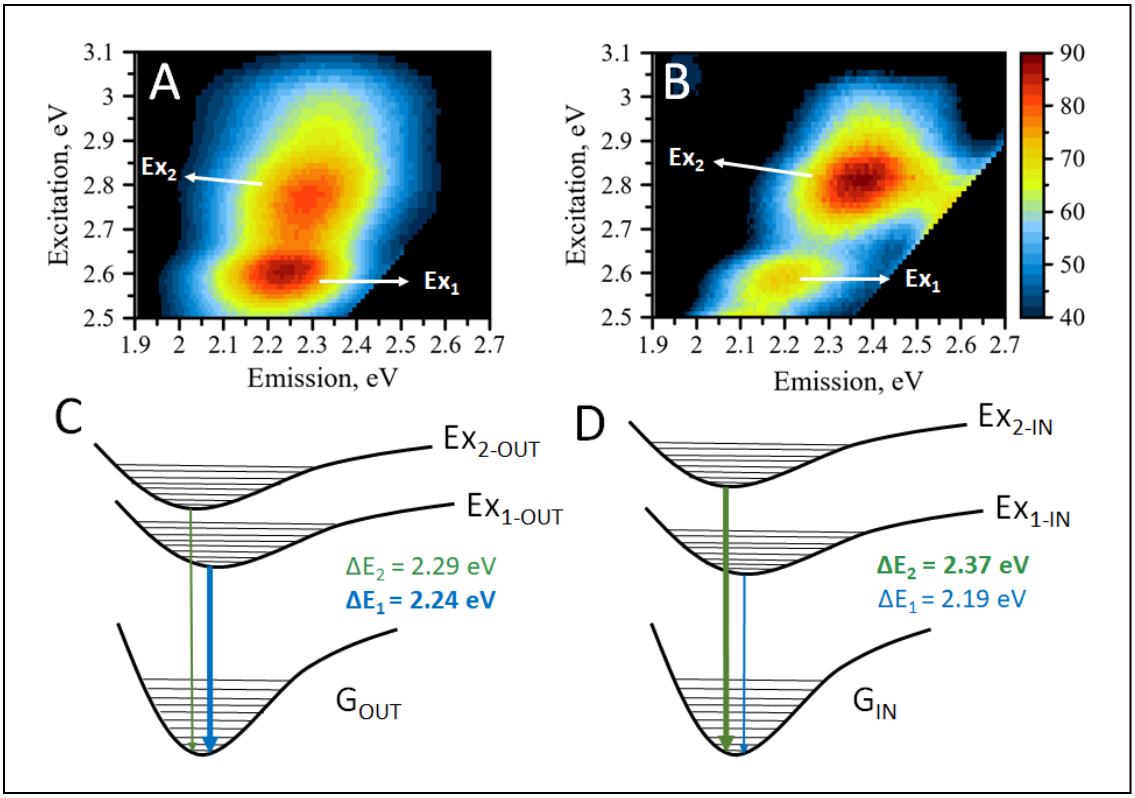

Figure S5. *Excitation/emission energy* map of silver nanoclusters in the "green" region: A) Excitation – emission matrix of AgNCs templated on Ring-dC$_{12\text{-OUT}}$, B) Excitation – emission matrix of AgNCs templated on Ring-dC$_{12\text{-IN}}$, C) Schematic Jablonski diagram for observed transitions for "green" emitting AgNC/ Ring-dC$_{12\text{-OUT}}$, D) Schematic Jablonski diagram for observed transitions for "green" emitting AgNC/ Ring-dC$_{12\text{-IN}}$.