Figure S1. $^1$H NMR spectrum of β-CD-SH.

Figure S2. $^1$H NMR spectrum of 11-MUAM.
Figure S3. Photographs of 15-crown-5-SH functionalized gold sols (A) before and (B) after addition of 25 μL K⁺ (10 mM). The fact that 15-crown-5-S-functionalized gold sol is responsive to K⁺ recognition demonstrates the applicability of this two-step method.

Figure S4. Photographs of 11-MUAM functionalized gold sols before (left) and after (right) addition of one drop of 20 % glutaradehyde solution which is a cross-linker between amino groups. The aggregation and precipitates shown in the right demonstrate the successful functionalization of 11-MUAM on gold nanoparticle.