

Supporting Information Available

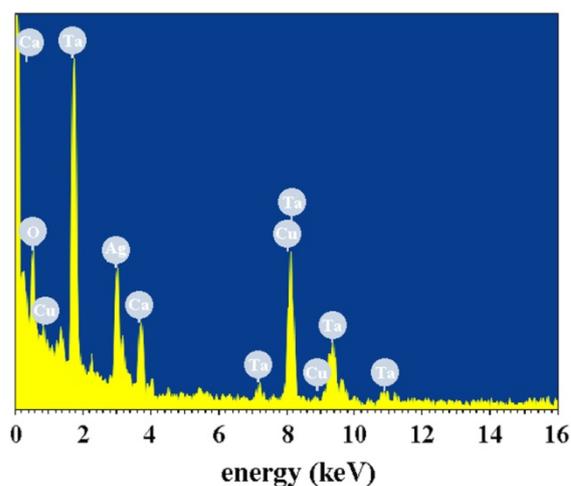


Figure S1. TEM: Energy-Dispersive X-ray spectroscopy of Ag/H₂CaTa₂O₇ (note that the Cu peaks come from the copper grid).

Table S1. The weight percent and atom percent results for each element from the EDX result.

| Element | Weight percent (%) | Atom percent (%) |
|---------|--------------------|------------------|
| O | 7.50 | 39.60 |
| Ca | 5.46 | 11.51 |
| Ag | 26.11 | 20.44 |
| Ta | 60.93 | 28.44 |

A more detailed analysis of the chemical composition of the surface of Ag/H₂CaTa₂O₇ taken with energy dispersive X-ray (EDX) is shown in Figure S1, the weight percent and the atom percent of oxygen, calcium, silver and tantalum are revealed in Table S1 respectively. The Ag content on the surface of Ag/H₂CaTa₂O₇ is 26.11%, which is close to the ICP-OES analysis result (23.26%).

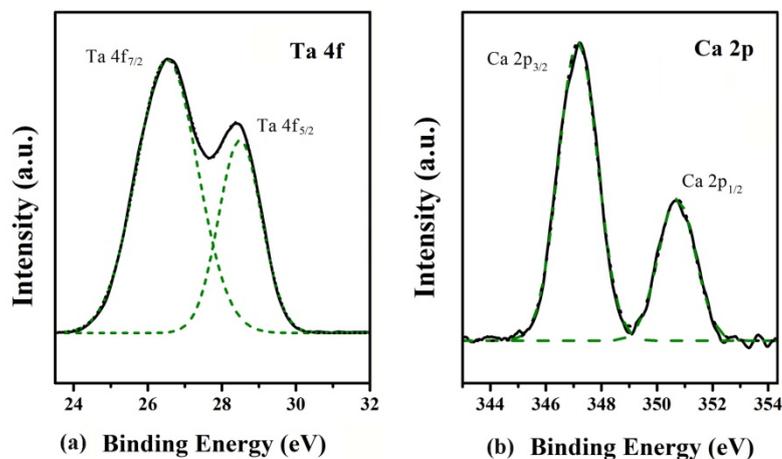


Figure S2. Ta 4f (a) and Ca 2p (b) photoelectron spectra at the surface of Ag/H₂CaTa₂O₇ (solid lines). Both spectra are decomposed into two bonding states (dotted line).

As shown in Figure S2 a, two peaks located at 26.6 eV and 28.5 eV could be observed in the Ta 4f spectrum, which could be assigned to metallic Ta⁵⁺ 4f_{7/2} and Ta⁵⁺ 4f_{5/2}. Meanwhile in Figure S2 b, the high-resolution XPS for the Ca 2p region shows two peaks positioned at 347.2 and 350.7 eV which are assigned to Ca²⁺. Since the D-glucopyranose assembled on the perovskite sheets did not grow directly on the spot of Ta or Ca. Instead, D-glucopyranose was attached to the perovskite sheets by the esterification reaction occurred between hydrolyzed (HO)TaO₅ site and D-glucopyranose. Thus by the silver mirror reaction, the silver nanoparticles can be easily assembled onto the interlayer space of the perovskite without affecting the valence of Ta and Ca.

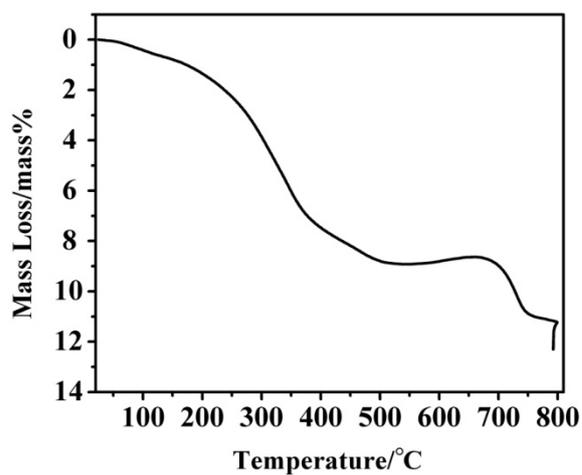


Figure S3. TG curve of D-glucopyranose- $\text{H}_2\text{CaTa}_2\text{O}_7$.

Figure S3 shows the TG curve of D-glucopyranose- $\text{H}_2\text{CaTa}_2\text{O}_7$. The temperature for the TGA samples were treated isothermally at $\sim 800^\circ\text{C}$ until the samples' weight was constant.

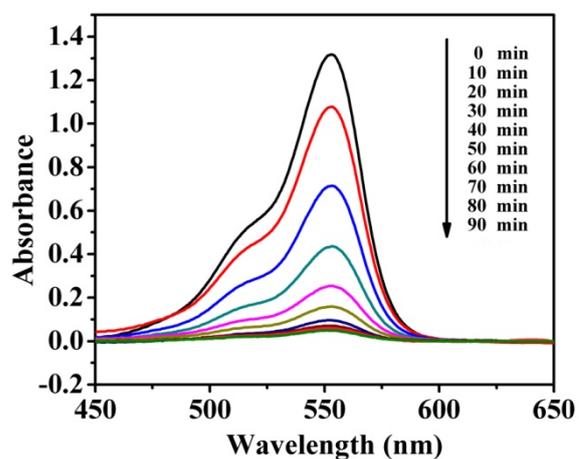


Figure S4. Time-dependent UV-visible absorption spectra for the reduction of RhB reduced by NaBH_4 in the presence of D-glucopyranose- $\text{H}_2\text{CaTa}_2\text{O}_7$.

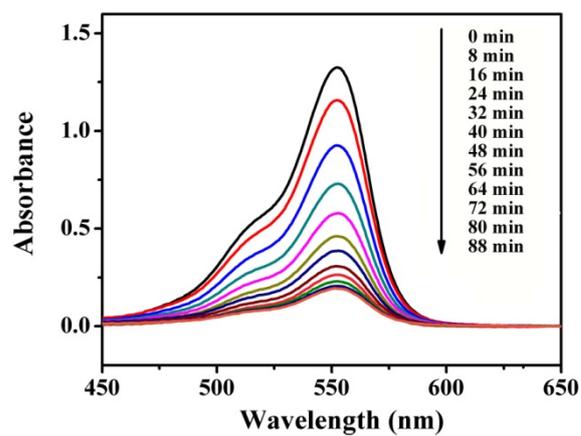


Figure S5. Time-dependent UV– visible absorption spectra for the reduction of RhB reduced by NaBH_4 .

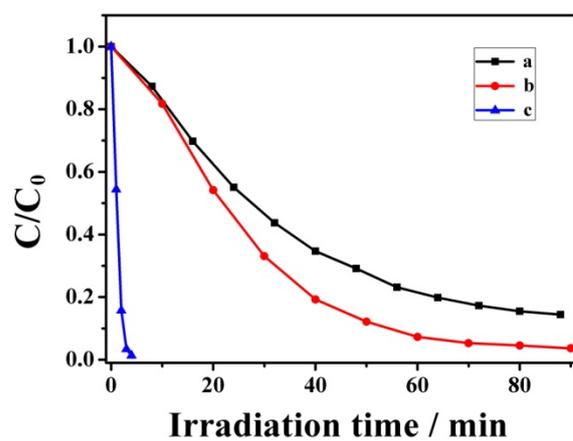


Figure S6. Catalytic reduction of RhB reduced by NaBH_4 over (a) no catalyst, (b) D-glucopyranose- $\text{H}_2\text{CaTa}_2\text{O}_7$, (c) $\text{Ag}/\text{H}_2\text{CaTa}_2\text{O}_7$.