Supporting Information

Photocatalytic Activity of 2D Nanosheets of Ferroelectric Dion-Jacobson Compounds

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Figure S1. XRD pattern of bulk and exfoliated RbBiNb₂O₇.



Figure S2. Raman spectra of bulk and exfoliated RbBiNb₂O₇, showing the material remained the same after exfoliation.



Figure S3. (a) Isotherm graph for exfoliated RbBiNb₂O₇. (b) Calculated specific surface area by multipoint BET method and pore size distribution by quenched solid density function theory (QSDFT) using the adsorption branch.



Figure S4. AFM images of exfoliated RbBiNb₂O₇ nanosheets. A straight line is drawn across some nanosheets to demonstrate their thickness. Results are plotted against distance below. The thickness of most nanosheets is in the range 5-7 nm.



Figure S5. Comparison of photodecolourisation of RhB by exfoliated RbBiNb₂O₇ and CsBiNb₂O₇, showing similar photocatalytic activity.



Figure S6. Photocatalytic performance of unexfoliated nanosheets, the change of RhB dye concentration is only around 2% to 8% and is fluactuating; this is possibly due to the fact that

unexfoliated bulk phase has very little photocatalytic activity and thus the influence of water evaporation under solar illumination, which increases dye concentration, becomes apparent.



Element	Weight%	Atomic%
СК	0.49	1.96
ОК	22.41	67.43
Rb L	9.28	5.23
Nb L	30.15	15.62
Ag L	5.07	2.26
Bi M	32.60	7.51

Figure S7. SEM EDX elemental analysis of Ag-decorated RbBiNb2O7 nanosheets.



Figure S8. Recyclability of Ag-decorated RbBiNb₂O₇ catalyst. After 2 hours of first photocatalytic test, Ag-decorated RbBiNb₂O₇ was washed and centrifuged three times for second 2-hour cycle. The efficiencies of catalysts after two cycles are compared and demonstrarted. Their reactivity are very similar (78% and 79% dye concentration reduction after 2 hours) after recycling, indicating that the catalysts can be successfully recycled and reused.



Figure S9. UV-vis spectra of centrifuged RbBiNb₂O₇, showing identical absorption onset for 500 rpm and 1000 rpm centrifuged powders, indicating that they have retained the same phase. The larger apparent absorbance across the visible range for the 500 rpm powder results from increased optical scattering of this material due to the higher powder loading and increased particle size.



Figure S10. Linear fits of photocatalysis data for RbBiNb₂O₇ prepared under different conditions.

Following a previous paper, we used the same pseudo-first-order relationship to calculate the rate constant:¹

$$\ln \frac{c}{c_0} = kt \tag{1}$$

where k is the rate constant, t the dye degradation time, C the dye concentration at time t and C_0 the initial dye concentration. The rate constant values where obtained by linear fitting of dye degradation results.

Reference

1. Y. Cui, J. Briscoe, S. Dunn, Chem. Mater, 2013, 25, 4215.