

Supplementary Information

Rapid reaction of MoS₂ nanosheets with Pb²⁺ and Pb⁴⁺ ions in solution

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S1. Supplementary Information 1

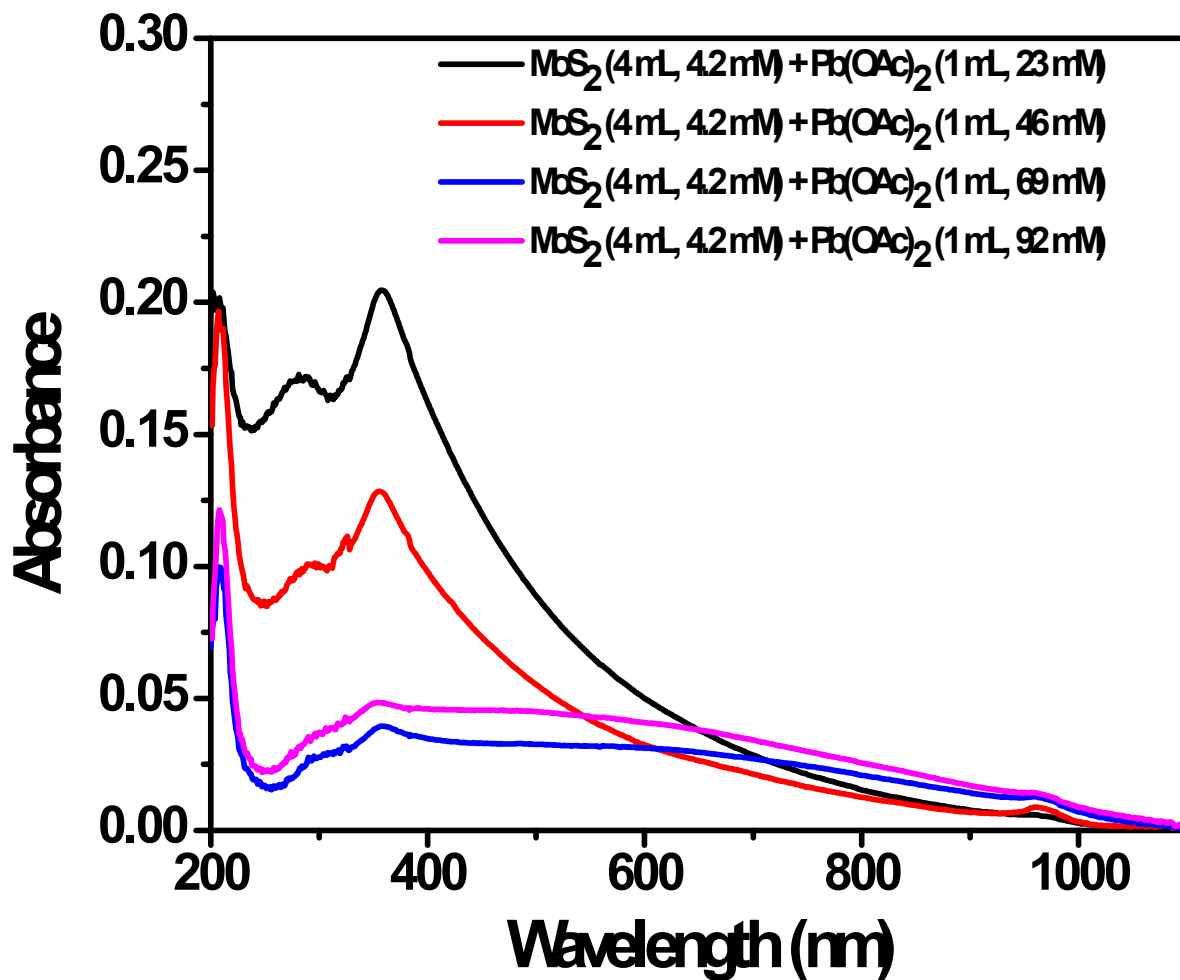


Fig. S1 Concentration-dependent UV/Vis spectra taken after 6 h of reaction. Lead acetate concentration varied from 23 mM, 46 mM, 69 mM to 92 mM keeping the MoS₂ concentration constant (4 mL, 4.2 mM).

S2. Supplementary Information 2

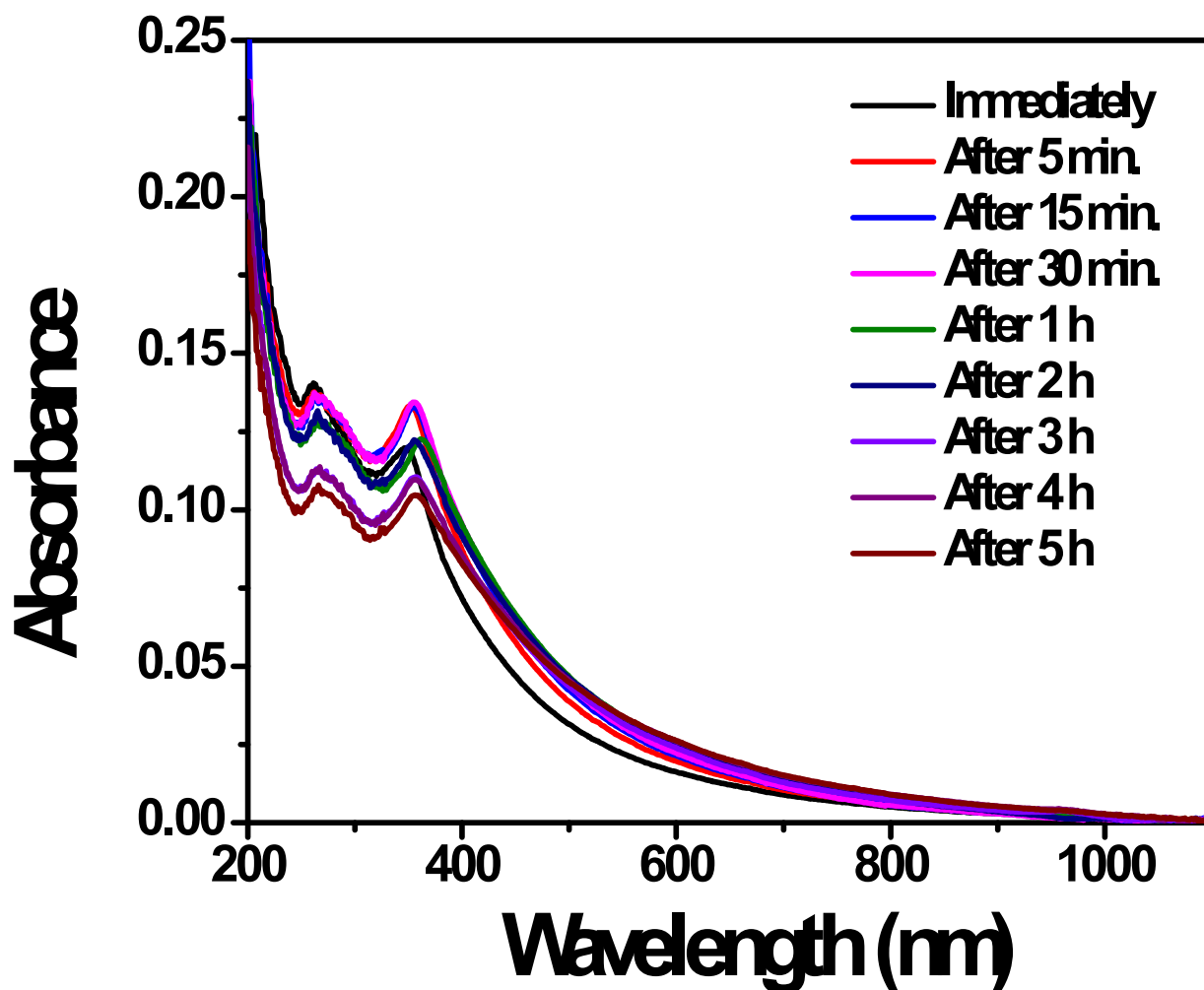


Fig. S2 Time-dependent UV/Vis spectra taken up to 5 h from immediately after the addition of lead acetate for the lowest concentration of lead acetate (23 mM).

S3. Supplementary Information 3

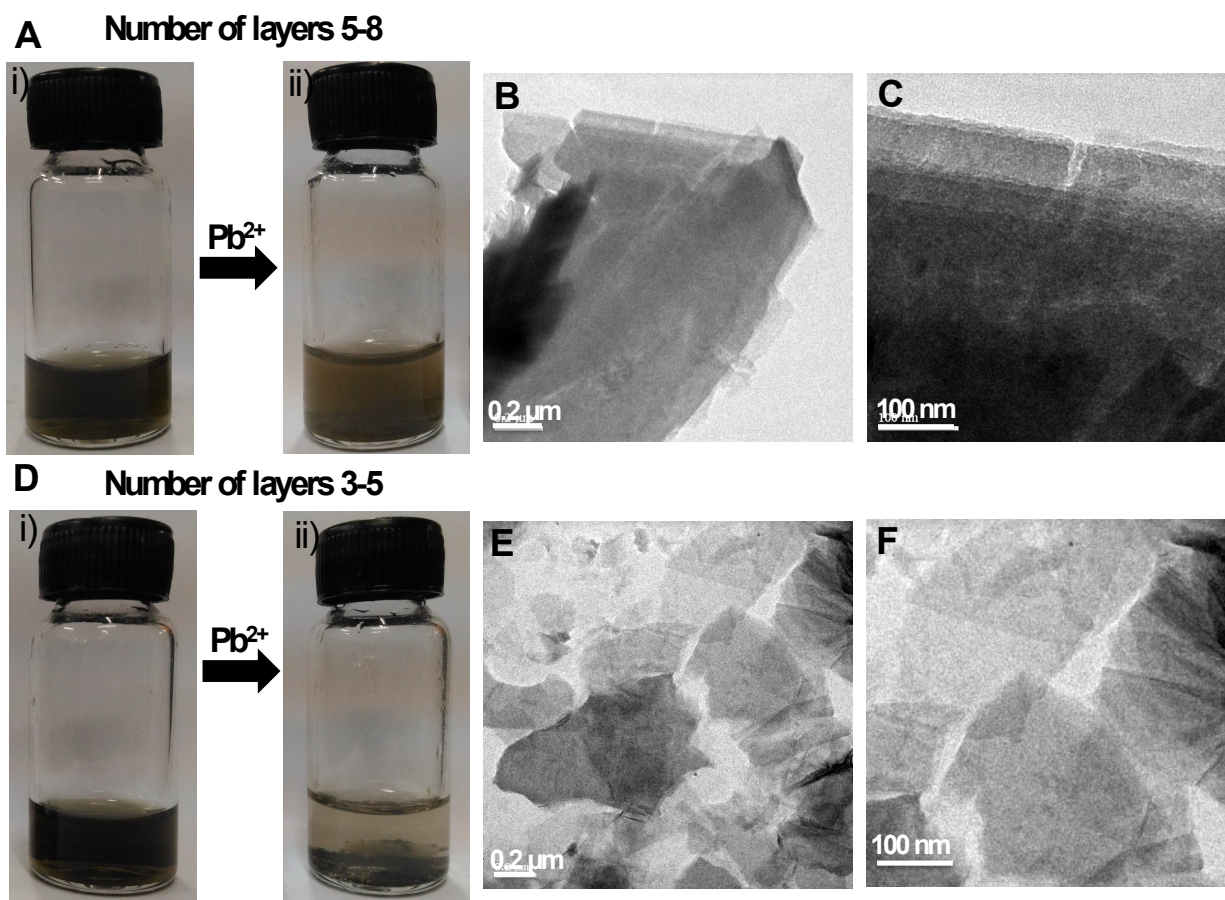


Fig. S3 (A) Photographs of the reaction mixture before (i) and after (ii) the addition of lead ions, respectively. (B-C) TEM images showing MoS₂ NS contains 5-8 layers of nanosheets. The MoS₂ dispersion containing 3-5 layers of nanosheets corresponding TEM images shown in (E-F), shows a clear reaction [D (i)] after the addition of lead ions. The method of preparation of these samples is described in the experimental section.

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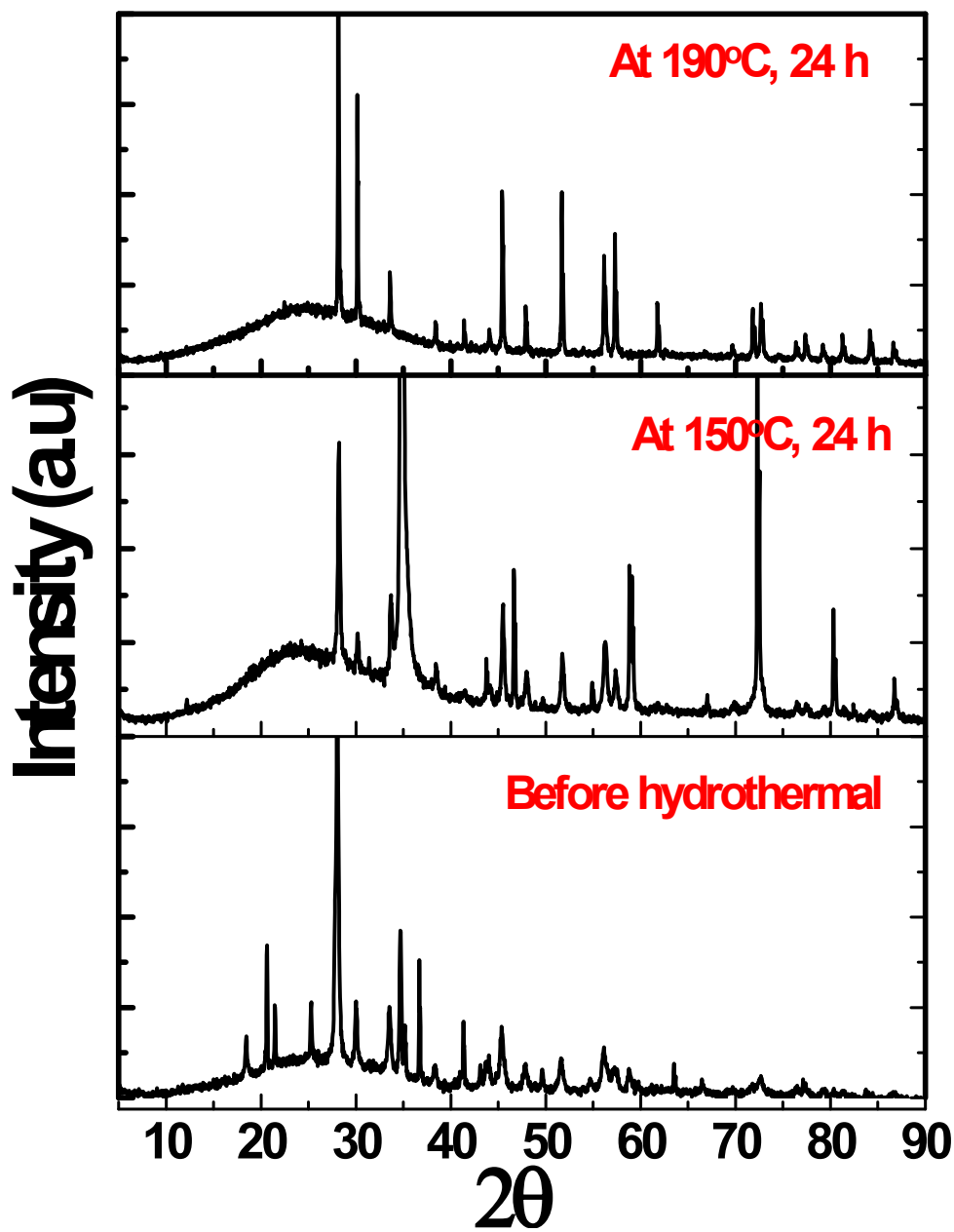


Fig. S4 The PXRD pattern of the reaction product ($\text{MoS}_2 + \text{Pb}^{2+}$) after hydrothermal treatment at various temperatures.

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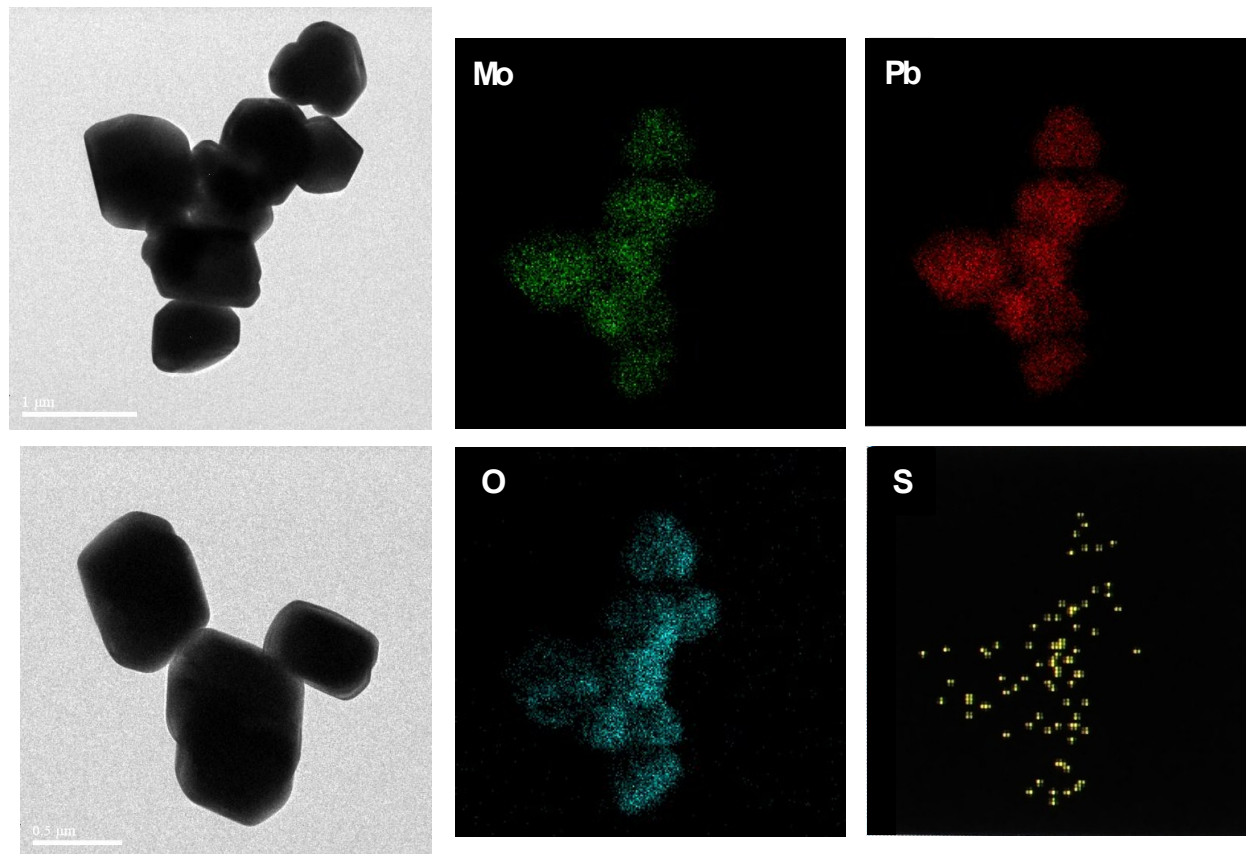


Fig. S5 TEM intensity map showing the presence of all the expected elements (Pb, Mo, O, and S) for the reaction product ($\text{MoS}_2 + \text{Pb}^{2+}$) after hydrothermal treatment at 190°C for 24 h.

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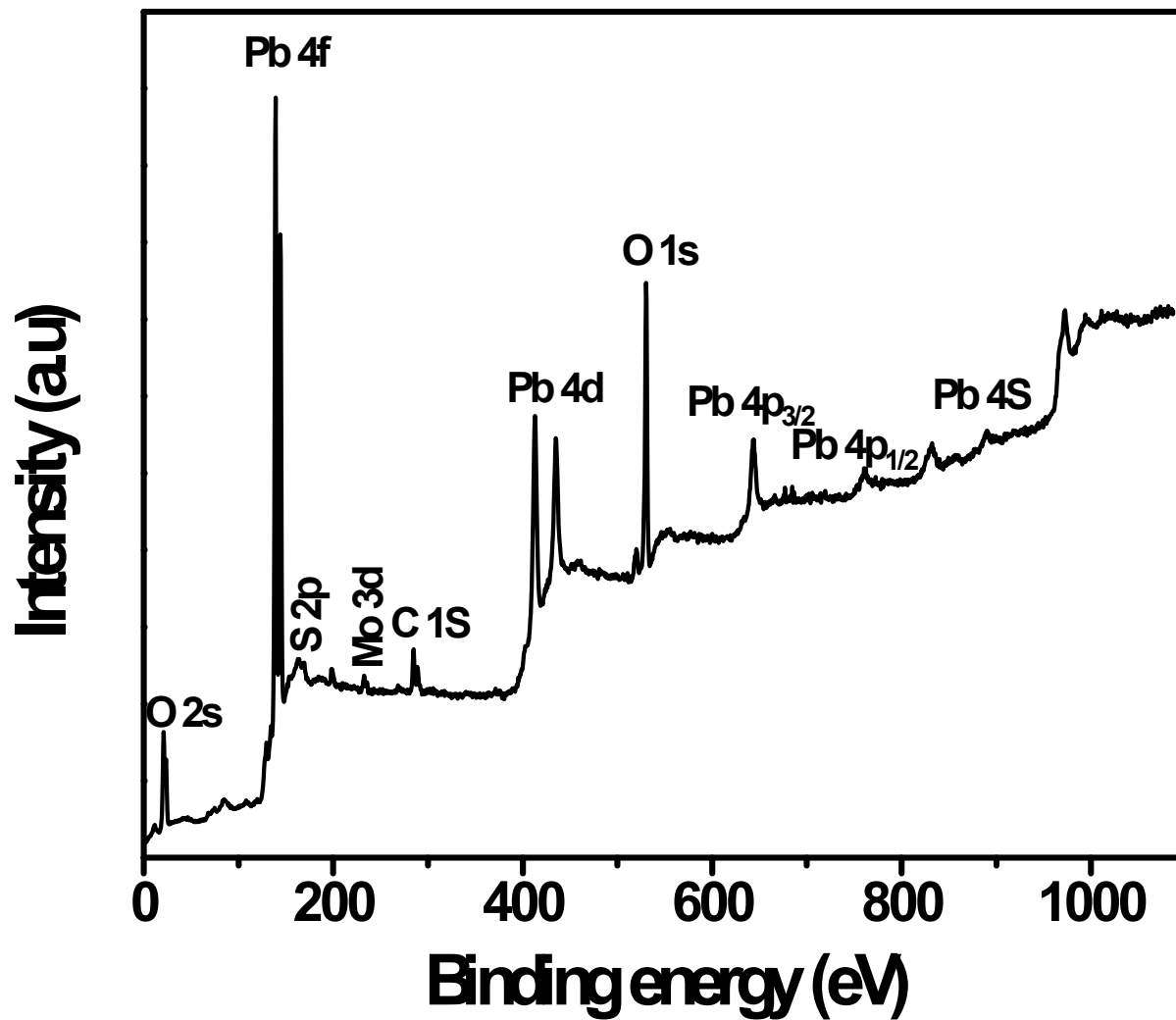


Fig. S6 XPS survey spectrum of the final product. No extra peak in the survey spectrum confirmed the absence of impurities.

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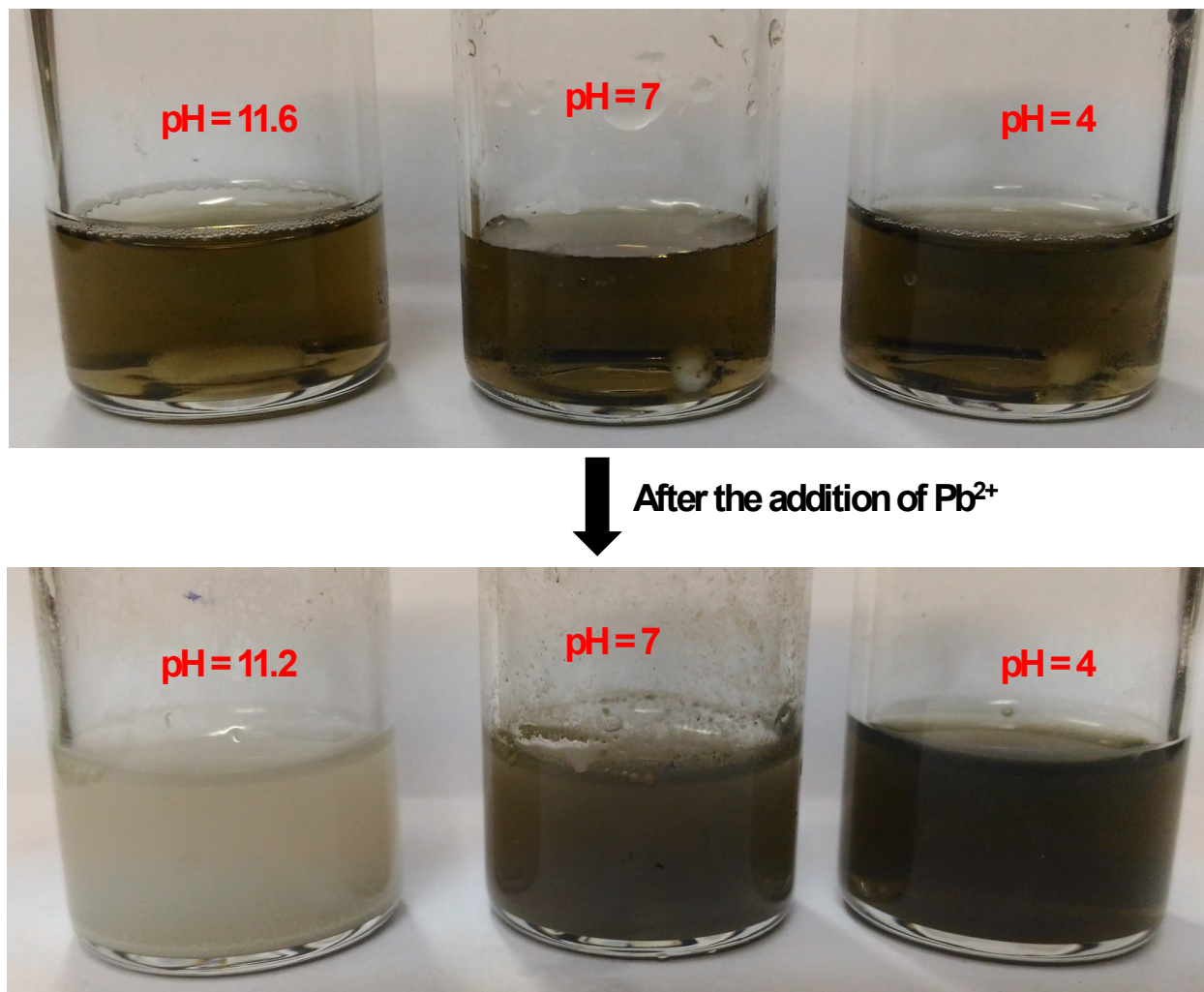


Fig. S7 Photographs of the reaction mixture at various pH showing the spontaneity of the reaction in basic medium. After successful reaction the pH was reduced (for 11.6 to 11.4).

S8. Supplementary Information 8

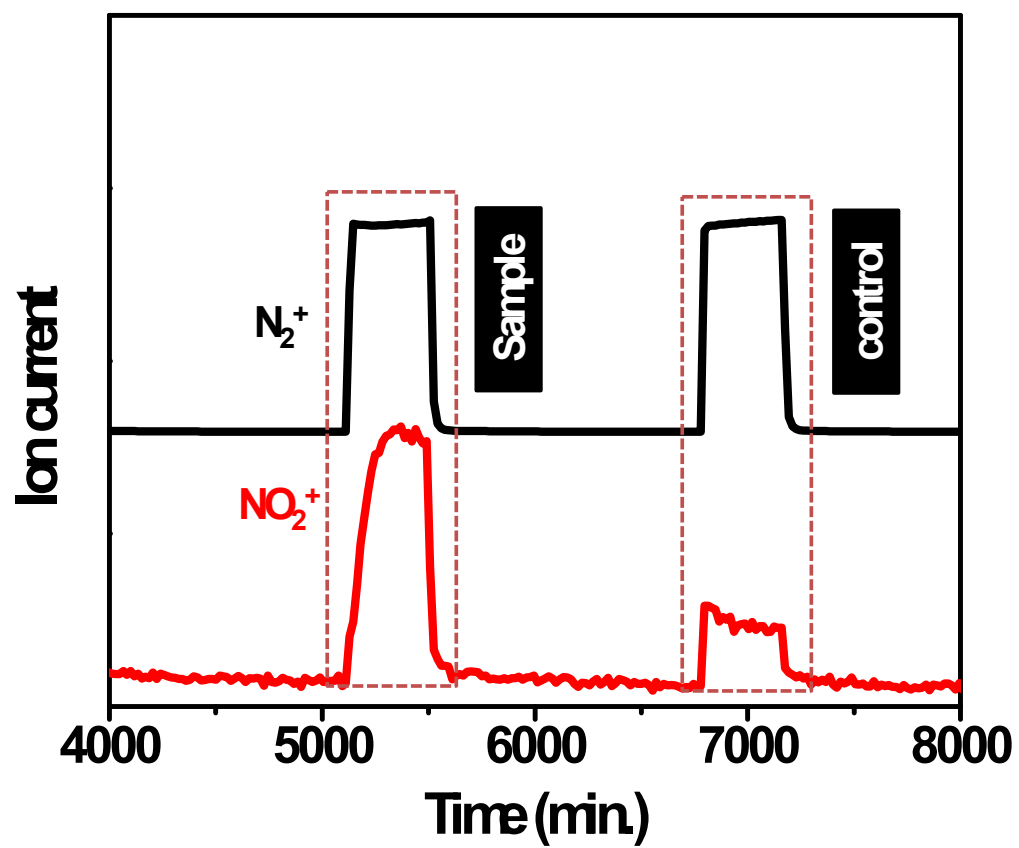


Fig. S8 Ion current vs time plot showing the evolution of NO_2 gas during the reaction of MoS_2 NSs with $Pb(NO_3)_2$.

Table 1.

The removal capacities of other materials for lead published elsewhere are listed below.

Adsorbents	q_{\max} (mg/g)	Link to References
Fe ₃ O ₄	22	1
Oxalate-loaded hematite	50	2
Activated carbon prepared from cherry kernels	180.3	3
Salix matsudana activated carbon	59.01	4
Multiwalled carbon nanotubes	97.08	5
MnO ₂	139.28	6
NiO	909.0	7
Fe ₃ O ₄	53.1	8
Al ₂ O ₃	114.6	9
TiO ₂	49.4	9
CeO ₂	9.2	10
WO ₃ ·H ₂ O	315.0	11
γ-ALOOH	124.2	12
α-FeOOH	80.0	13
Mg(OH) ₂	775.4	14

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