

1 **Supplementary Material: Controlled low dimensionality in hybrid**
2 **organic-inorganic superlattices**

3
4 **One-dimensional electron density map calculated from XRD results**

5 X-ray diffraction spectrum reflects the electronic and atomic structure information of
6 the material, which can be reversed from the XRD results.

7 The electron density along the c-axis could be obtained by

$$\rho(z) = \sum_{j=1}^{\infty} F_{00l} \cos\left(\frac{2\pi lz}{c}\right) \quad (\text{S1})$$

9
10 where l , F_{00l} , and c represents the Miller index of the (00l) crystal plane, structure factor
11 of the 00l reflections, and the interlayer distances, respectively.

12 The structure factors of the 00l reflections F_{00l} were derived from their intensities
13 corrected for Lorentz-polarization effects

$$|F_{00l}| = (I/L_p)^{1/2} \quad (\text{S2})$$

14
15 where I is the intensity of the peak intensity and L_p is the Lorentz-polarization factor
16 which can be written as

$$L_p = (1 + \cos^2 2\theta) / (\sin^2 \theta \cos \theta) \quad (\text{S3})$$

17
18
19 The absolute values for F_{00l} can be derived by Eq. (4). The signs (phase) of the structure
20 factor can be directly obtained instead from the scattering contributions of the inorganic
21 atoms framework by assuming that the contribution from the intercalated organic
22 molecules is relatively small.

$$F_{00l} = \sum_{j=1}^N 2f_j \cos(2\pi lz_j) \quad (\text{S4})$$

23
24
25 where f_j is the scattering factor of j atom, z_j is its fractional coordinate on the c axis.

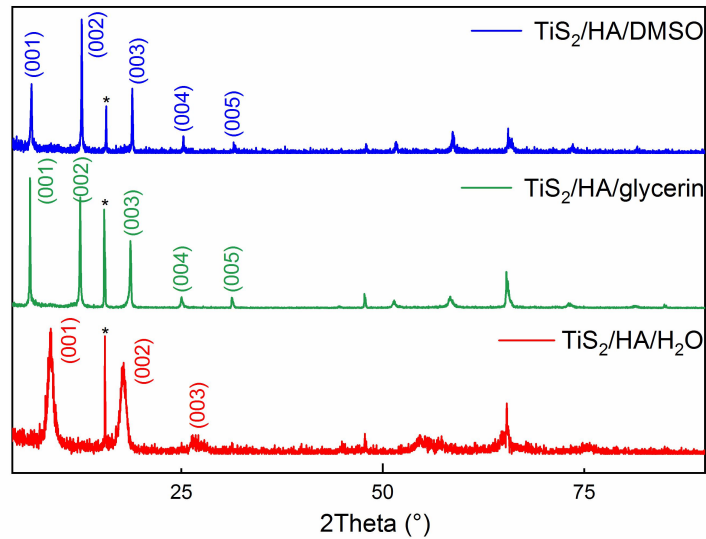
26 Using Eq. (5), the sign for each F_{00l} was determined and combined with the absolute
27

28 value in Eq. (4), and the one dimensional electron density map can be derived.

29

30 XRD result

31



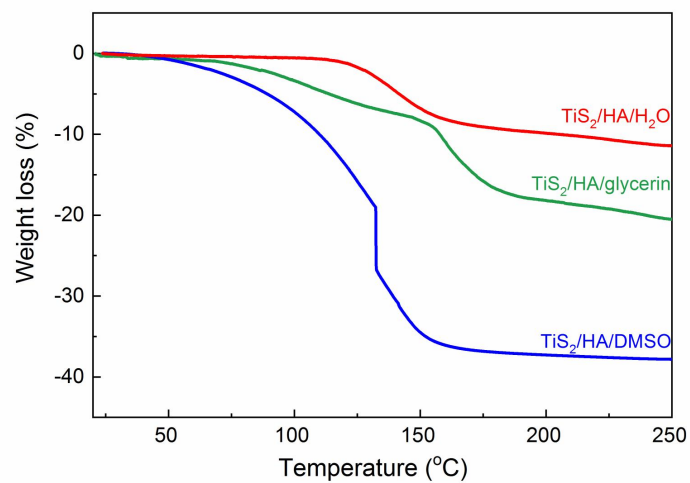
32

33 **Supplementary Figure 1.** XRD result of hybrid inorganic-organic superlattices,
34 showing the shift of (001) peaks as the result of the intercalation of organic molecules.

35 The origin (001) peak of TiS₂ single crystal is marked by the asterisk.

36

37 TGA result

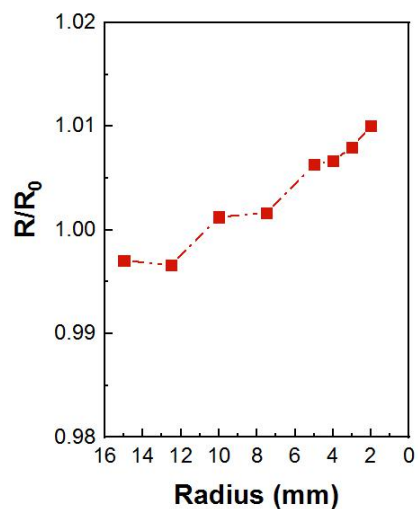


38

39 **Supplementary Figure 2.** TGA result of hybrid inorganic-organic superlattices.

40

41 Flexibility test



42

43 **Supplementary Figure 3.** The sheet resistance R as a function of bending radius (r) for
 44 a 54- μm -thick $\text{TiS}_2/\text{HA}/\text{DMSO}$ sample, where R_0 is the corresponding value of its
 45 original state before bending.

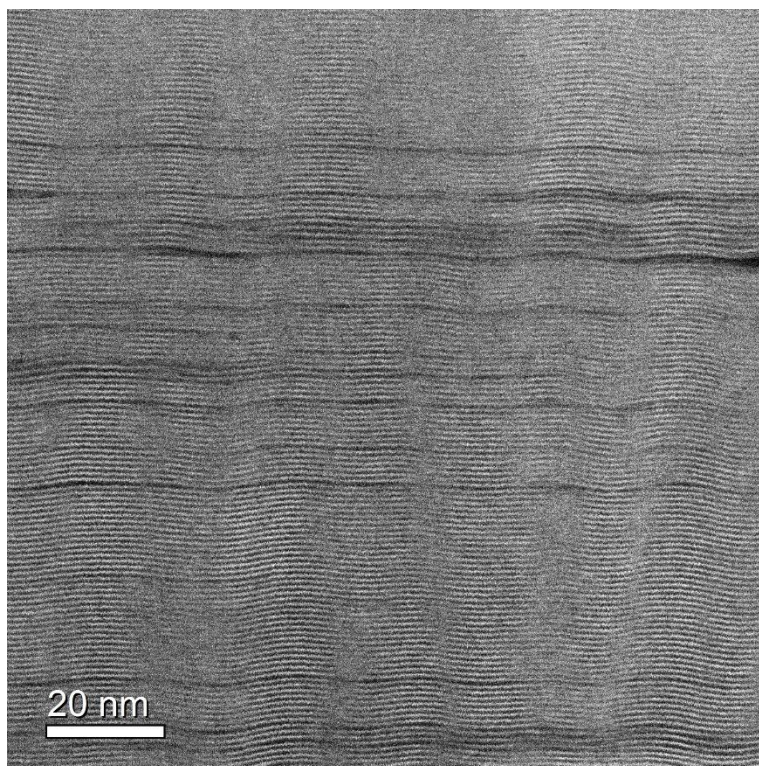
46

47

48

49

50



51

52

53

Supplementary Figure 4. HAADF-STEM figure of $\text{TiS}_2/\text{HA}/\text{H}_2\text{O}$.