Supplementary Information

1. Moiré Superlattice Characterization Results

According to the method described in the main text, AFM was used to characterize the heterostructure region to reveal the moiré superlattice. The complete results are shown in Figure S1.

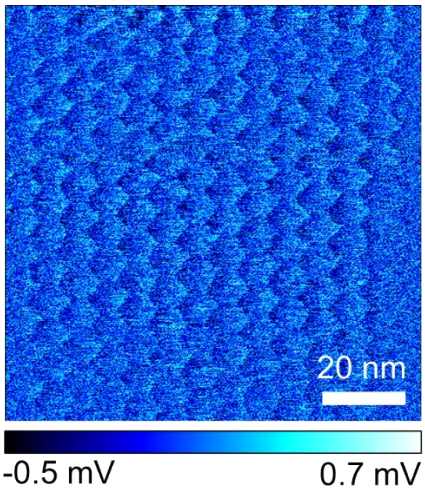

Fig.S1 Moiré superlattice characterization results.

2. Thickness Characterization of Hexagonal Boron Nitride (hBN)

To ensure sample consistency, AFM characterization of the hexagonal boron nitride used in the process was conducted according to the method described in the main text. The results are shown in Figure S2.

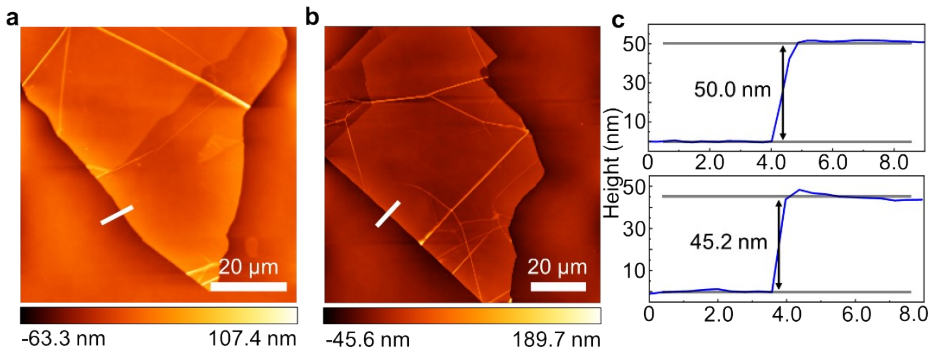

Fig.S2 Thickness and morphology characterization of hexagonal boron nitride (hBN) used in the study. (a) Top hBN layer; (b) Bottom hBN layer; (c) hBN thickness measured along the marked line, the upper image shows the top hBN layer with a thickness of approximately 50 nm, and the lower image shows the bottom hBN layer with a thickness of approximately 45.2 nm.

3. Differential Reflection Spectroscopy Test

We conducted reflection spectroscopy tests at 4K low temperature, with the data undergoing baseline flattening. The results are shown in Figure S3 below:

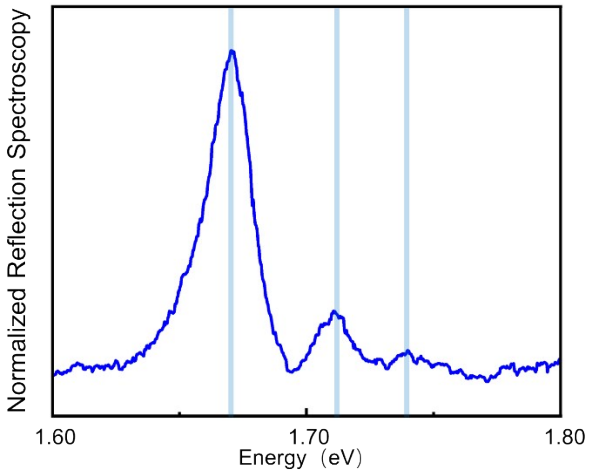

Fig.S3 Reflection spectroscopy test results at 4K low temperature

As can be seen in the figure, the resonance energy of the lowest energy exciton peak is located at 1.67 eV, which matches the reports in previous articles; followed by higher energy exciton peaks at 1.71 eV and 1.74 eV, respectively. The relevant experiments confirm the existence of moiré excitons and that the stacking angle meets the requirements.