

## Supporting Information

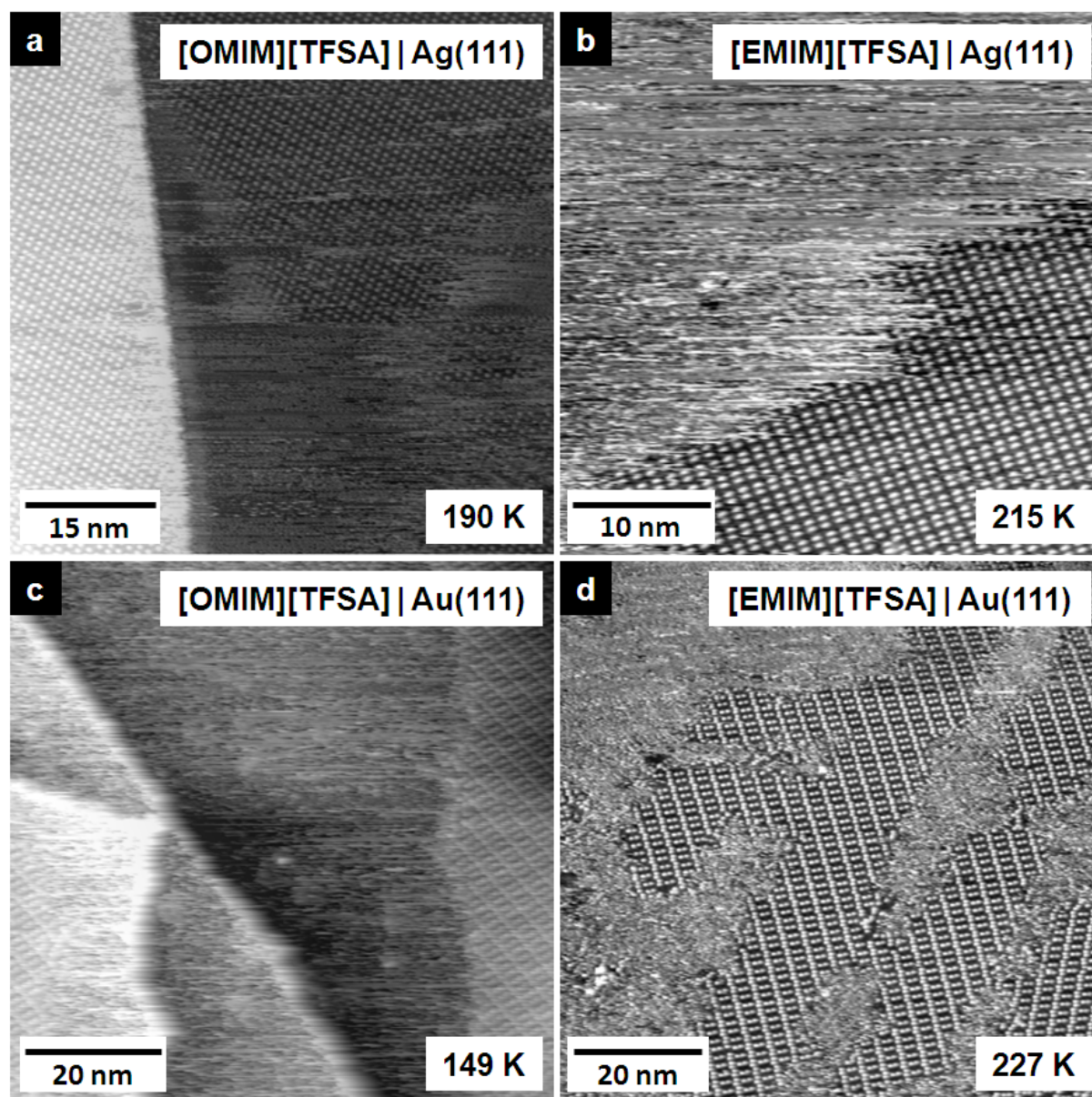


Figure S1: STM images of [EMIM][TFSA] and [OMIM][TFSA] on Ag(111) and Au(111) when heating up from 90 K to RT when the 2D disordered domains are already molten, but with the 2D crystalline domains still stable. (a:  $T = 190$  K,  $U_T = -1.10$  V,  $I_T = 60$  pA; b:  $T = 215$  K,  $U_T = -1.06$  V,  $I_T = 100$  pA; c:  $T = 149$  K,  $U_T = -1.10$  V,  $I_T = 20$  pA; d:  $T = 227$  K,  $U_T = -1.63$  V,  $I_T = 60$  pA;  $\Delta T = \pm 5$  K)