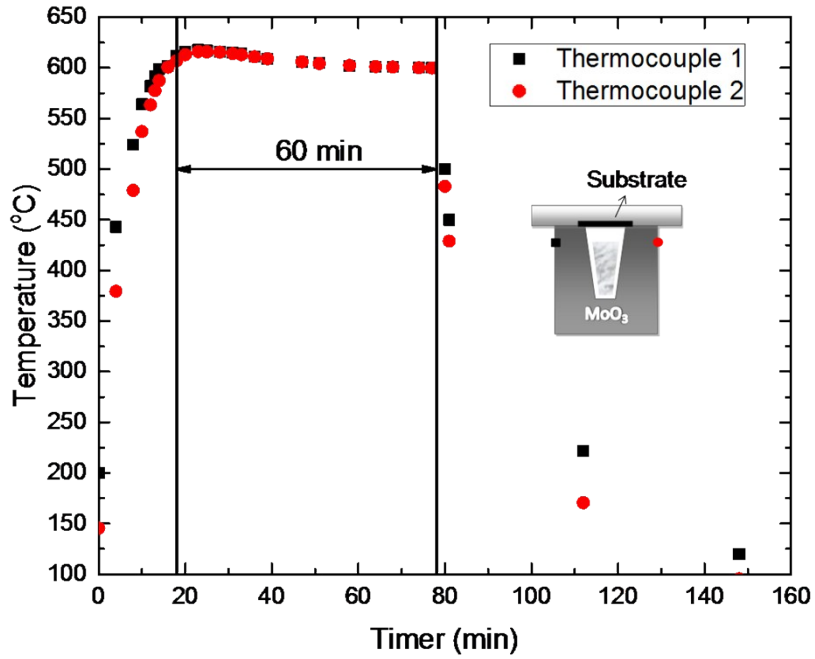
Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

I. Temporal behaviour of temperature during growth

The temperature was measured with thermocouples located in the front (red) and in the rear (black) regions of the graphite crucible. The absence of temperature gradients can be noted. (Fig. S.1)



II. Thickness calculation from the IBS spectrum.

IBS simulation provides the atomic areal density (a.d.) in atm/cm². To convert this value to thickness we used the relation:

$$t = \frac{a.d.}{\rho^{at}_{MoO_2}}$$

$\rho^{at}_{MoO_2}$ stands for the atomic density for MoO_2 and t is the thickness.

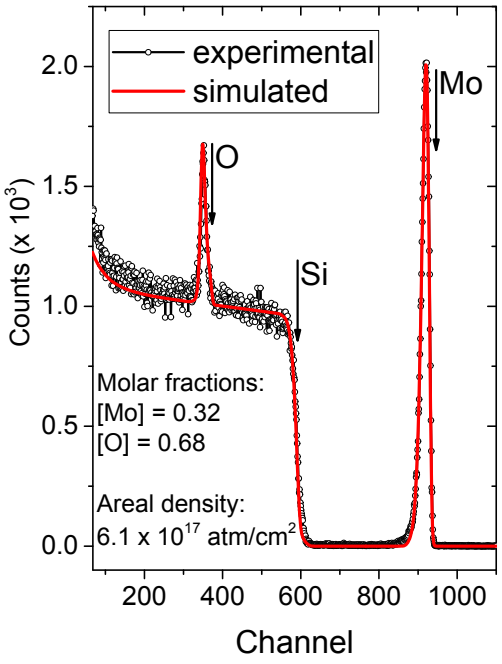
The atomic density was calculated using:

$$\rho^{at}_{MoO_2} = \frac{3 * \rho_{MoO_2}}{M_{MoO_2} N_{Av}}$$ in which ρ_{MoO_2}, M_{MoO_2} and N_{Av} are the density, the formula unit mass, and the Avogadro number. The factor 3 in the numerator represent the number of atoms in the formula unit of MoO_2.

The values of the different constants are:

$M_{MoO_2} = 127.92$; $\rho_{MoO_2} = 6.47\ g/cm^3$

IBS spectrum for a sample grown onto a Si substrate. (Fig. S.2)



III. Graphite boat for the MoO_2 growth and in-situ tellurization (Fig. S.3)

The substrate is exposed first to the MoO_3 powder to form the MoO_2 film or flakes and then to the Te vapours for tellurization and formation of $MoTe_2$