

Supplementary Material (Figures S1 –S6 and Table S1)

The manuscript with the title

“On the formation mechanism and model of Surface nanoscale Kirkendall effect on the Au catalyst island/ GaAs substrate by thermal VLS method with two steps temperature mode”

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Sending to Catalysts , MDPI

Figure S1: The SNKE was not formed at the thin Au catalyst island (< 20 nm) between two Au catalyst islands (b) on the **sample S1**, the NWs have grown regularly by thermal VLS method

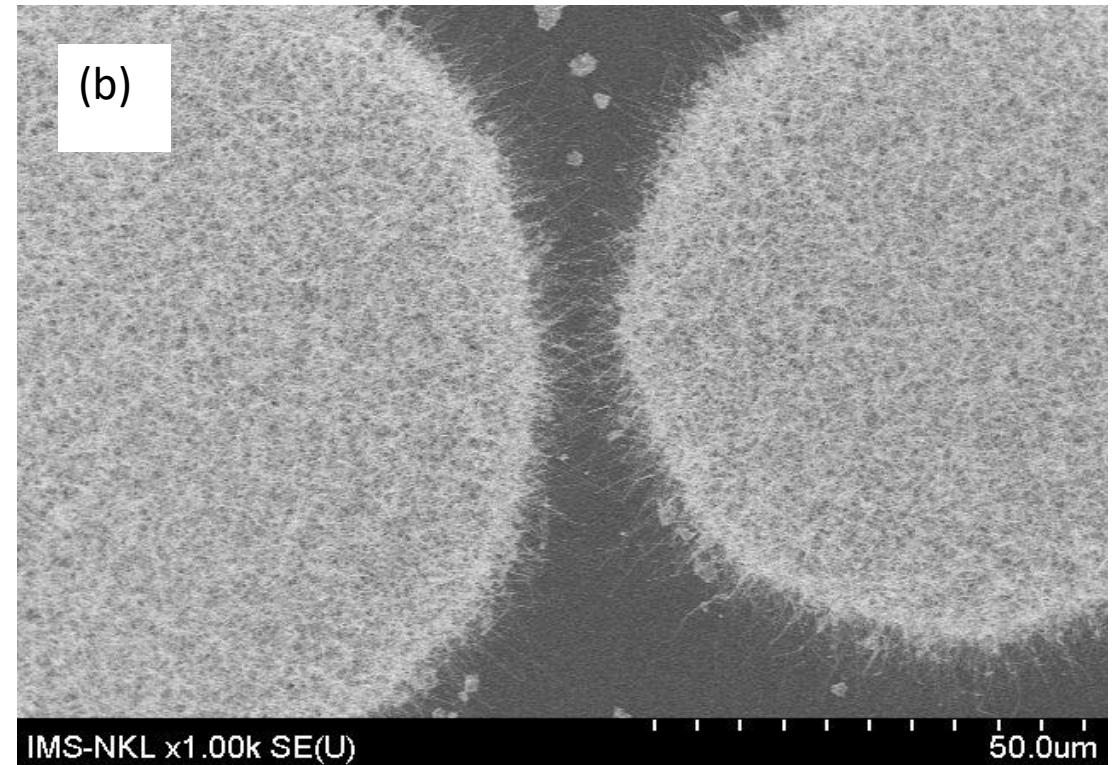
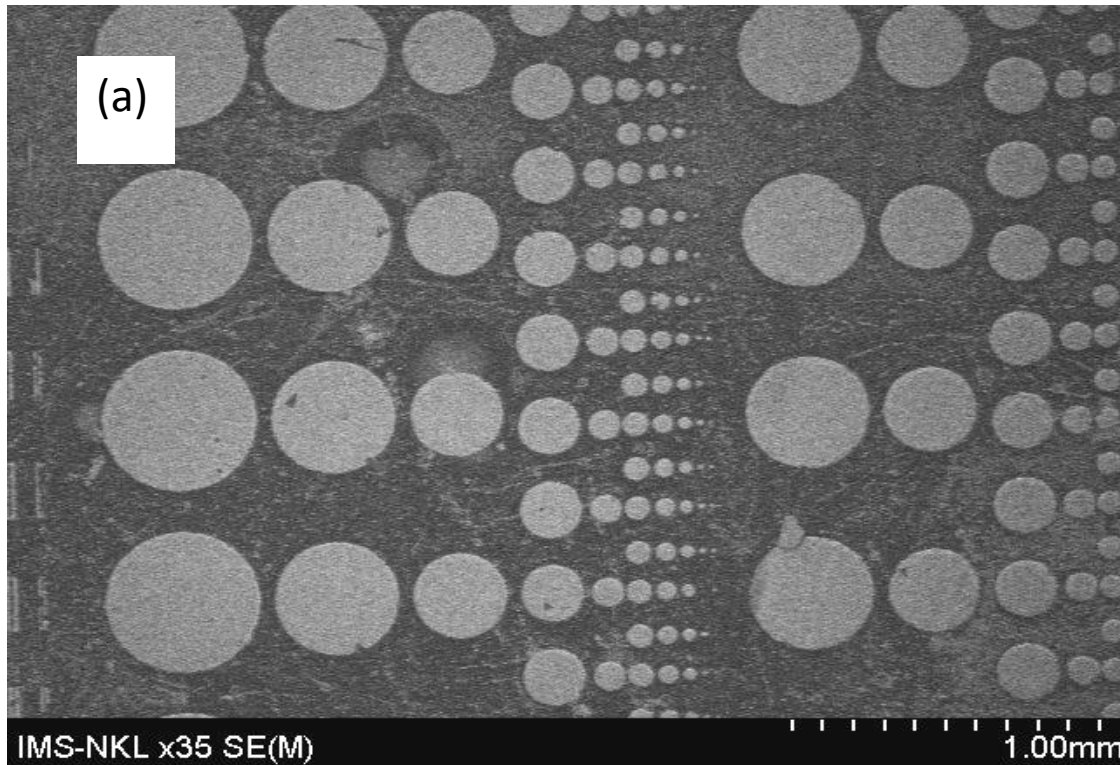


Figure S2: SEM micrographs of surface nanoscale Au/Ga/O clusters (SNCs) formed inside the Au catalyst island on **Sample S2**. The SNCs have the sizes of from 30 nm to about 100 nm (b,c,d) . Several NWs are began to grow (b) .

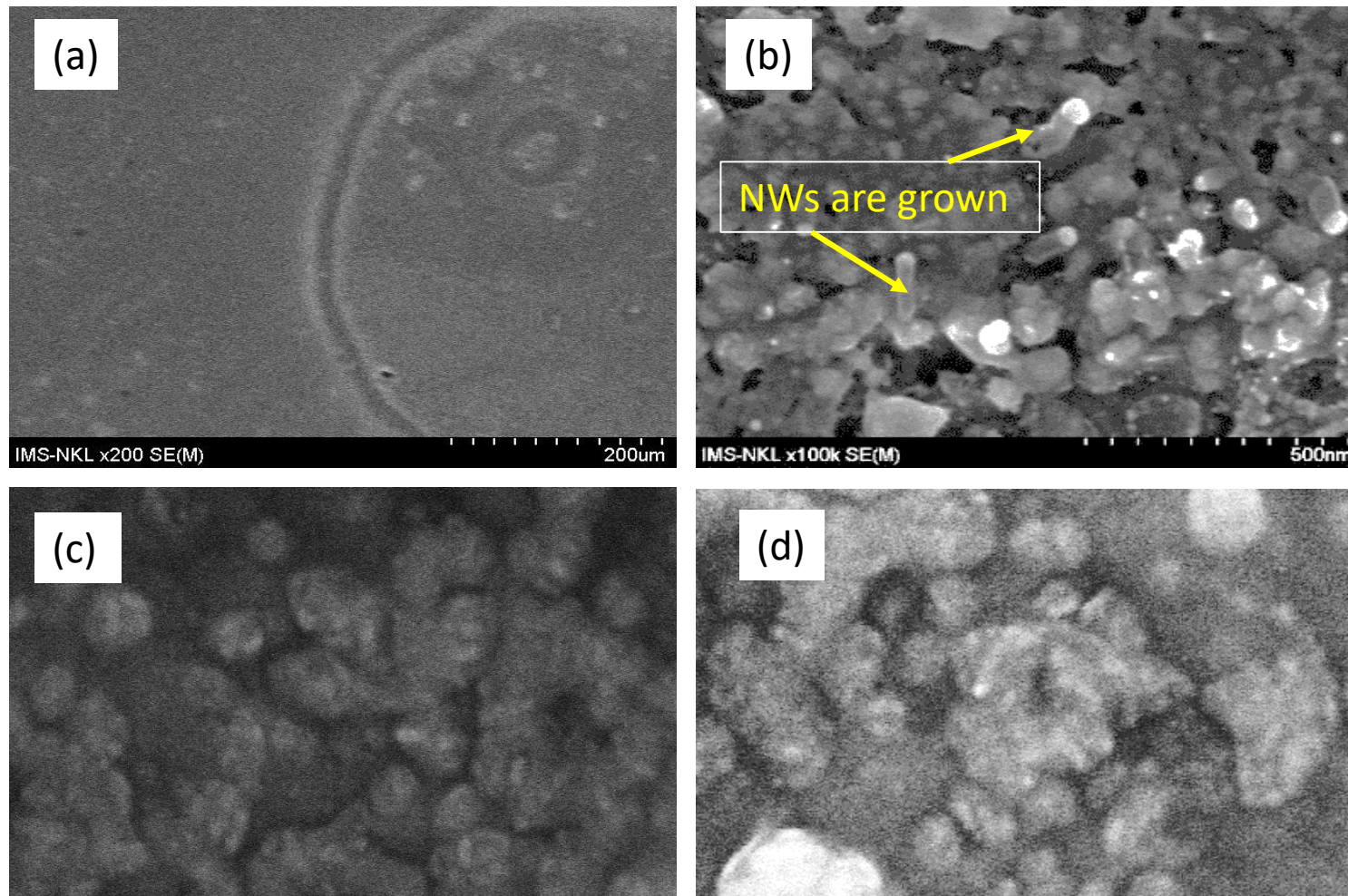


Figure S3: The different magnified SEM micrographs of the different corners of the bare GaAs hole formed on the place of the former Au catalyst island on the **sample S6**, where SNKE completely formed, simultaneously the mixed nanomaterials (NPs, NWs, NRs) have grown on GaAs surface along the radius direction (arrows direction)

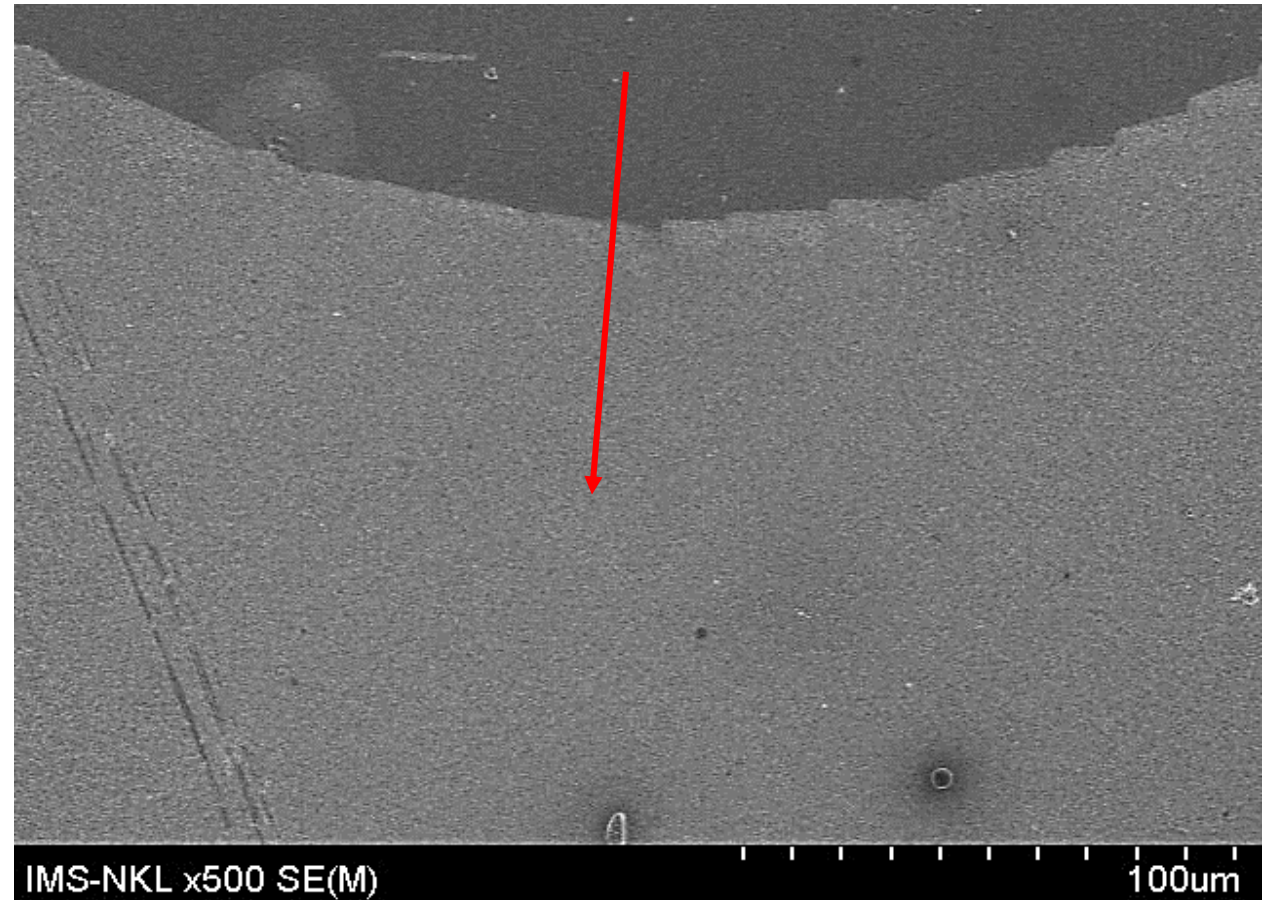
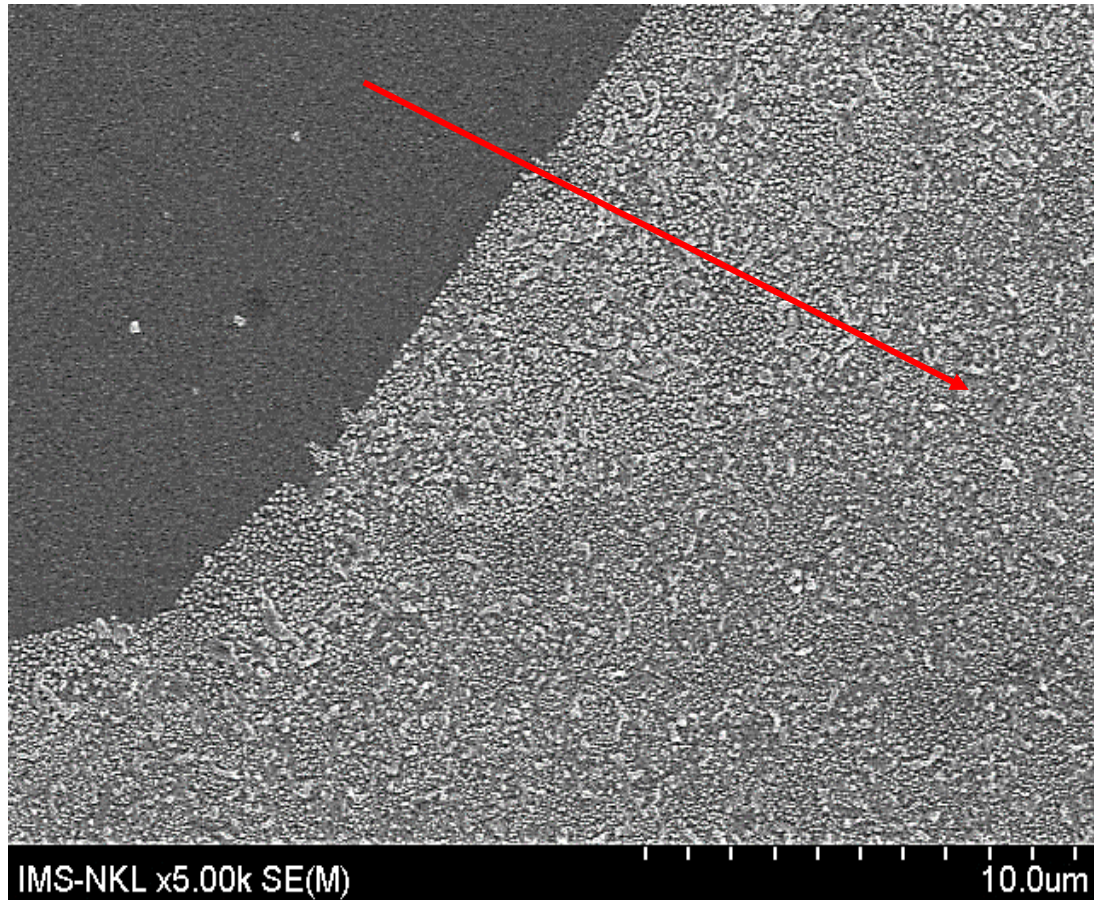


Figure S4: The different magnified SEM micrographs of NWs with the weakened bases and big tips (spheres) on **Sample S3** that are diffused outward and grown

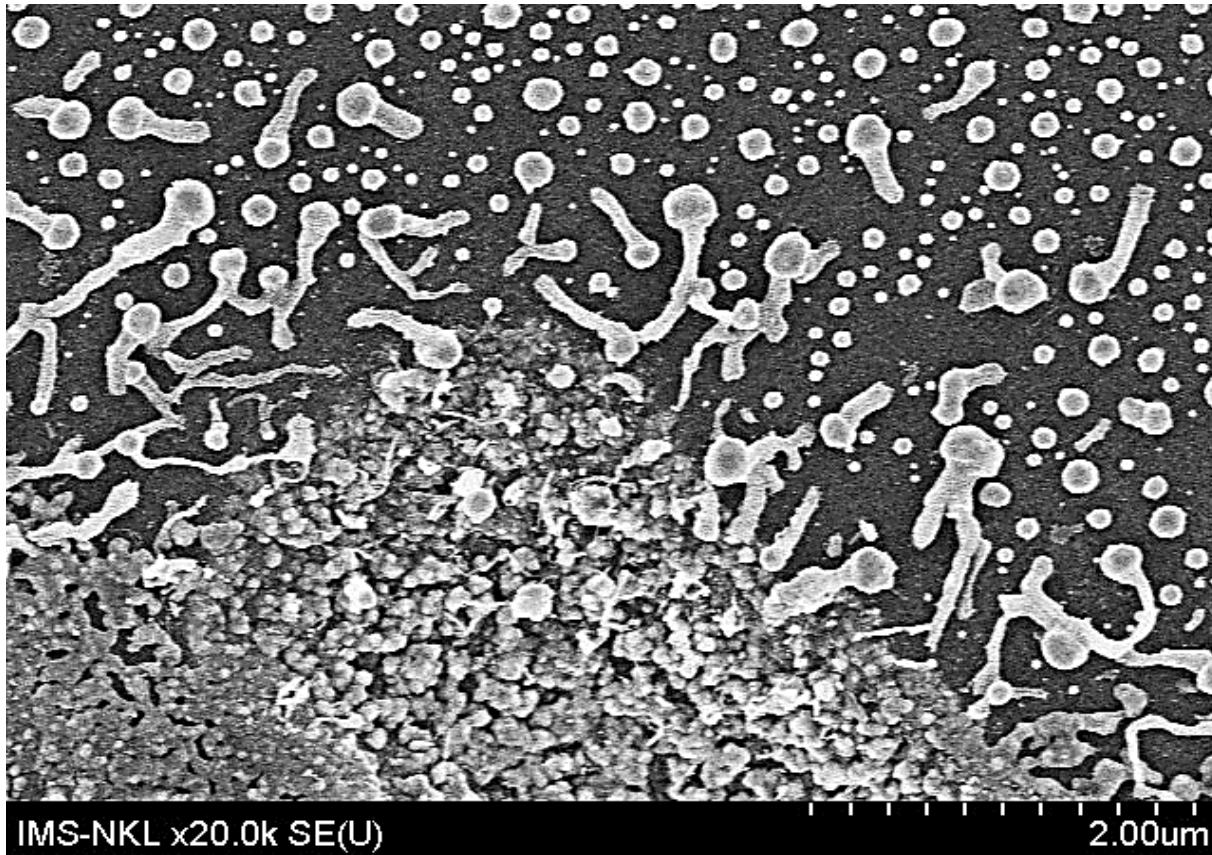
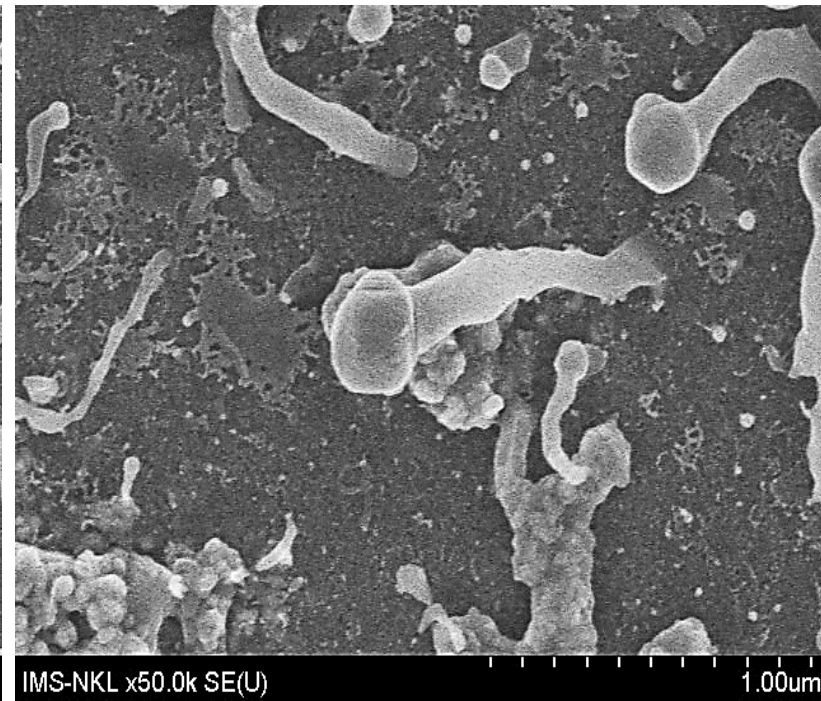
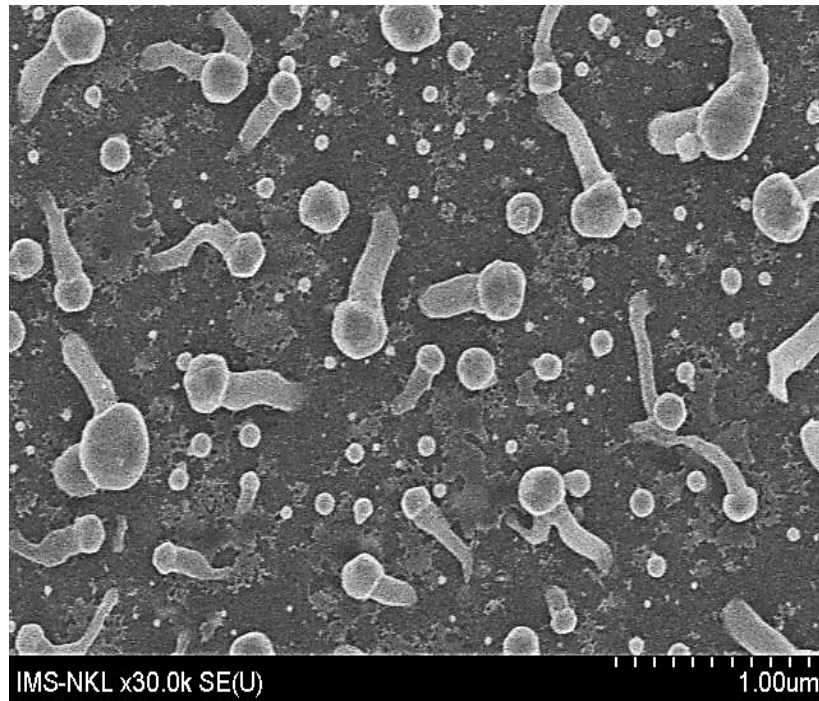
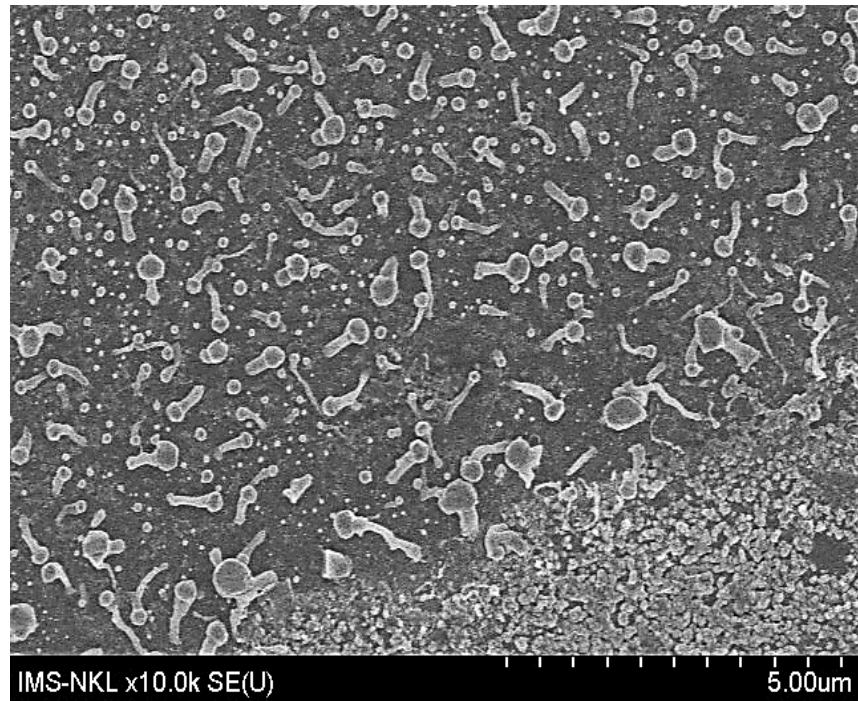


Figure S5: The different magnified SEM micrographs of NWs grown on the outside of Au catalyst island/strip on **Sample S5** with weaken bases and big tips (spheres) located on the NWs tops



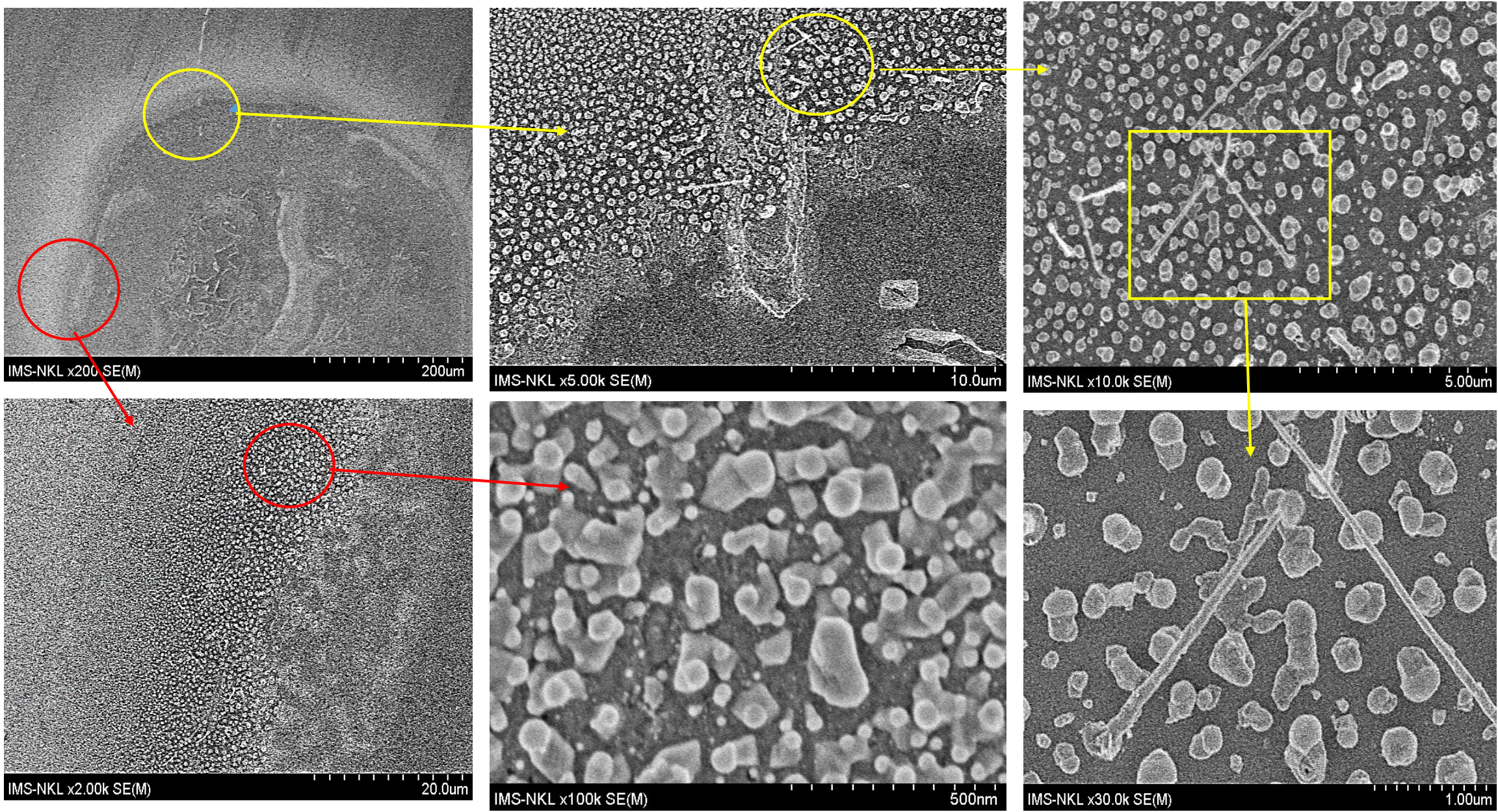


Figure S6 : Several SEM micrographs on the Sample S10 more in detail concerning Fig.2

Table S1. The symbols of several typical samples and technological conditions using in the experiments by the VLS method with two steps temperature mode in the 10^{-1} - 10^{-2} torr low vacuum closed tube for investigation of the SNKE formation on Au island/GaAs substrate

GaAs labeled Samples	Au islands thickness (nm)	t_1 (mins)	T_1 (°C)	t_2 (mins)	t_3 (mins)	T_2 (°C)	t_4 (mins)
S1	20	82	410	20	34	610	30
S2	35	88	440	20	40	640	30
S3	35	82	410	20	40	620	30
S5	35	82	410	20	40	620	30
S6	70	82	410	20	48	650	60
S7	70	82	410	20	48	650	90
S9	1000	82	410	20	42	620	30
S10	1000	88	440	20	40	640	30
S 15	220	82	410	20	48	650	30