Supporting information: Facile synthesis of heterogeneous indium nanoparticles for formate production via CO_2 electroreduction

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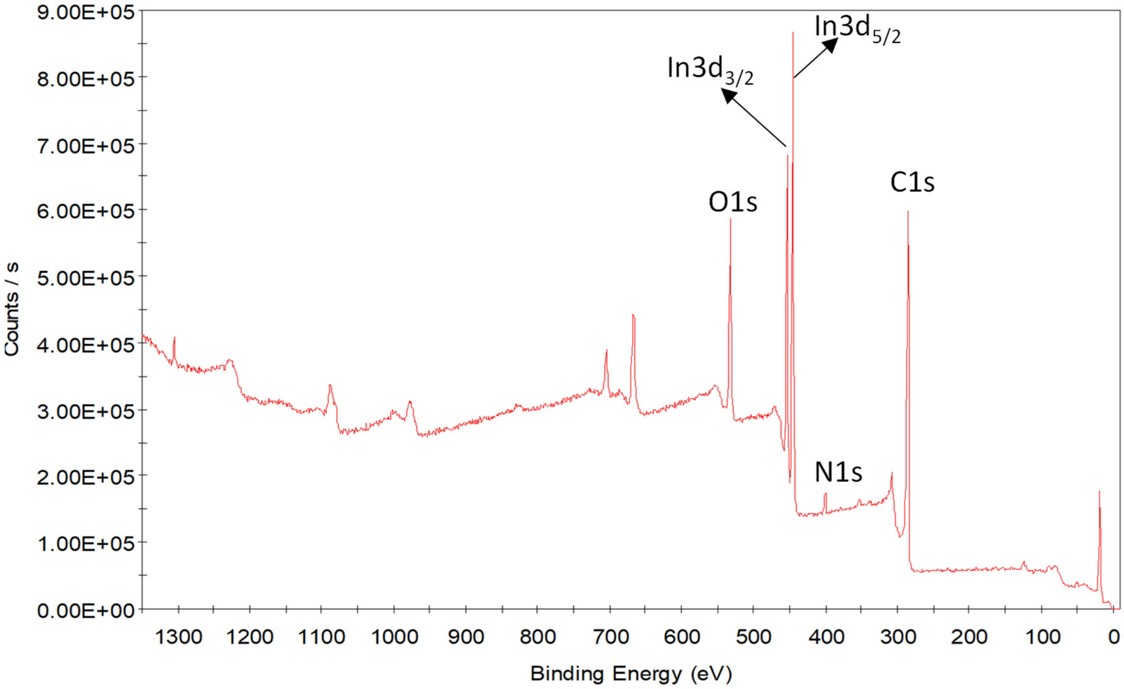


Figure S1. XPS survey data for the In_{50}/C_{50} sample showing the signals for the C 1s, N 1s, O 1s and In 3d levels.

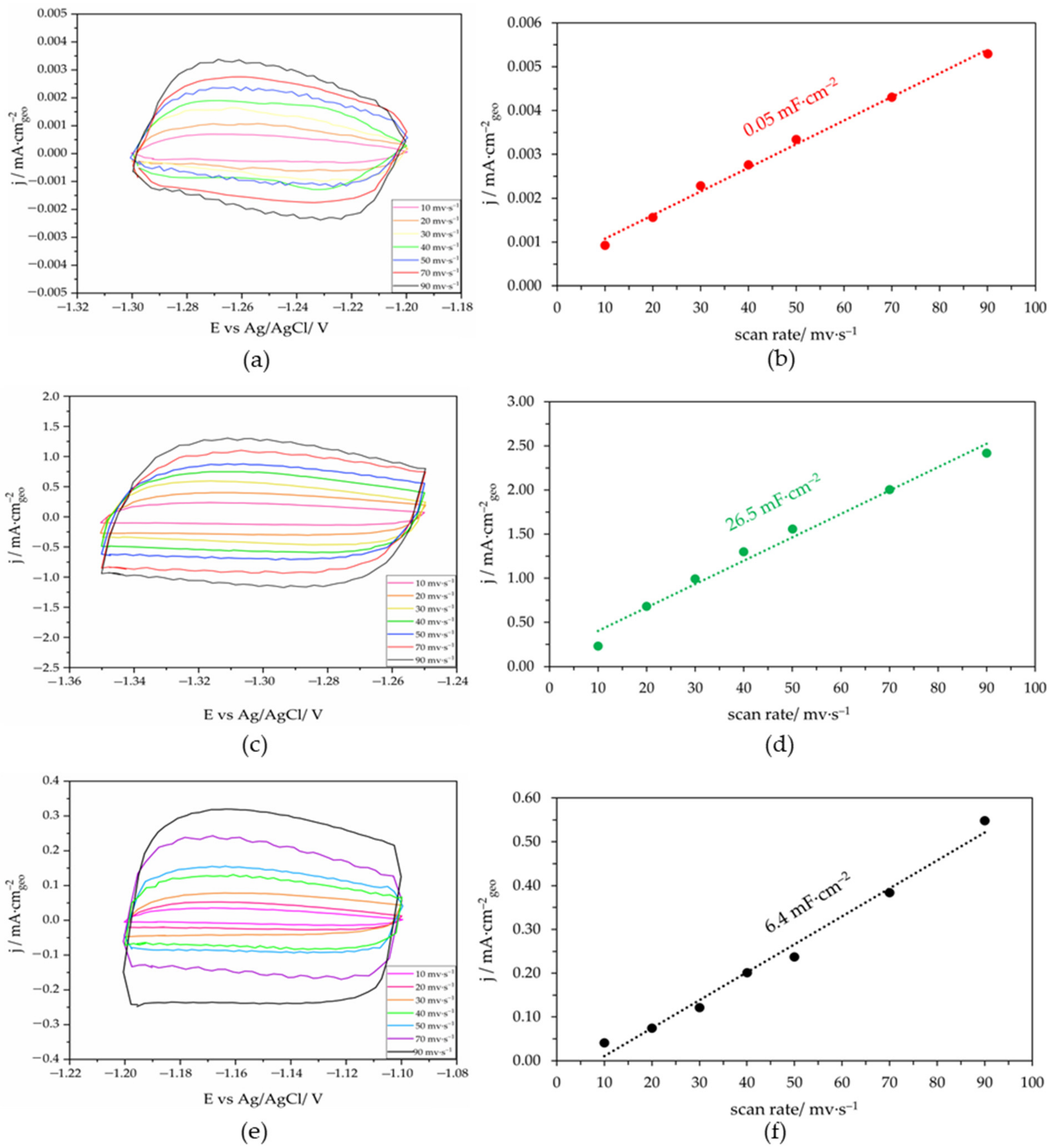


Figure S2. (a) CVS curves of In$_{KOH}$ at scan rates from 10 to 90 mV·s^{-1}. (b) Capacitive current density against the scan rates and capacitive double layer (C_{dl}) estimation of In$_{KOH}$; (c) CVS curves of In$_{20}$/C$_{80}$ at scan rates from 10 to 90 mV·s^{-1}**;** (d) Capacitive current density against the scan rates and capacitive double layer (C_{dl}) estimation of In$_{20}$/C$_{80}$; (e) CVS curves of In$_{50}$/C$_{50}$ at scan rates from 10 to 90 mV·s^{-1}; (e) Capacitive current density against the scan rates and capacitive double layer (C_{dl}) estimation of In$_{50}$/C$_{50}$.

The potential windows chosen for double layer capacitance measurements, correspond with ranges where no faradaic processes are observed. The capacitive current densities at -1.25 V for In$_{KOH}$, -1.30 V for In$_{20}$/C$_{80}$ and -1,15 V for In$_{50}$/C$_{50}$, was plotted against the scan rate, and the resulting linear fitting was used to determine the specific capacitances of the materials.

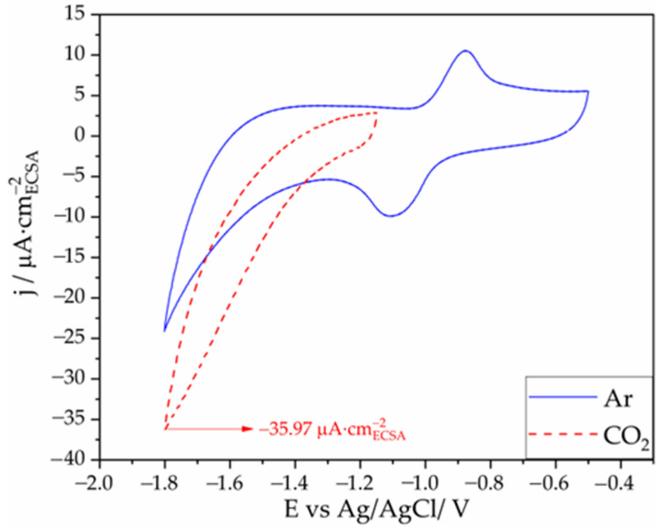
The specific ECSA of the materials is calculated from the double layer capacitance (C_{dl}) following the next equation:

$$ECSA = \frac{S \cdot C_{dl}}{C_s}$$

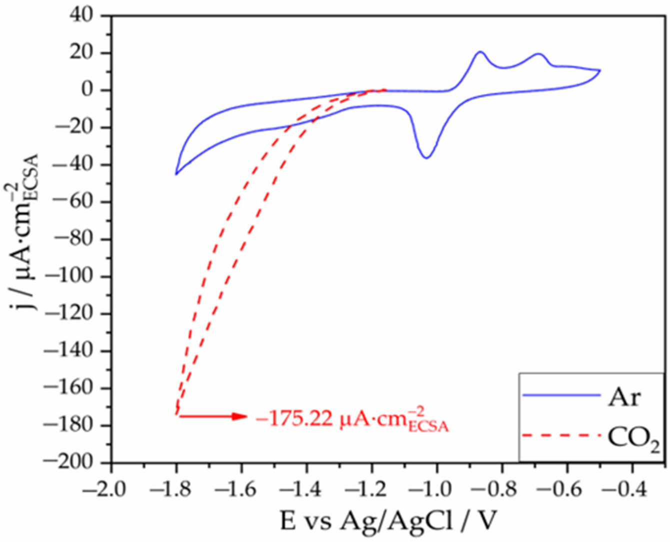
Where S is equivalent to the geometric area of the working electrode and C_s is the specific capacitance of the sample or the capacitance of an atomically smooth planar surface of the material per unit area under identical electrolyte conditions. The value of C_s was 0.029 mF cm^{-2} based on the generally used values on literature [1–3]

Table S1. Double layer capacitance and ECSA calculation of the best materials synthesized: $In_{20}C_{80}$ and $In_{50}C_{50}$.

Electrode	**Double layer capacitance (C_{dl}) (mF·cm^{-2})**	**ECSA (cm^2)**
In_{KOH}	0.05	5.17
$In_{20}C_{80}$ NPs	26.5	2741.38
$In_{50}C_{50}$ NPs	6.4	662.07



(a)



(b)

Figure S3. Cyclic voltammograms normalized by electrochemically active surface area (ECSA) obtained in Ar (solid lines) and CO_2 (dashed lines) saturated solutions ($KHCO_3$ 0.5 M + KCl 0.45 M) for: (a) In_{20}/C_{80} and (b) In_{50}/C_{50} NPs. Scan rate 50 mV·s^{-1}

References

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