Structure and electrochemical activity of nickel aluminium fluoride nanosheets during urea electro-oxidation in an alkaline solution

Saba A. Aladeemy,[a,b] Abdullah M. Al-Mayouf,[a,b] Mabrook S. Amer,[a] Nouf H. Alotaibi,[a] Mark T. Weller,[b] Mohamed A. Ghanem[a]*

[a]Electrochemical Sciences Research Chair (ESRC), Chemistry Department, King Saud University, 11451 Riyadh, Saudi Arabia.

[b]K. A.CAR Energy Research and Innovation Center at Riyadh.

[c]Chemistry Department, Cardiff University, Cardiff, CF10 3AT, UK.

* Corresponding author Email: mghanem@ksu.edu.sa; Tel: +966 114670405;

Fax: +96614675992, ORCID 0000-0003-2866-9016

Supporting Information

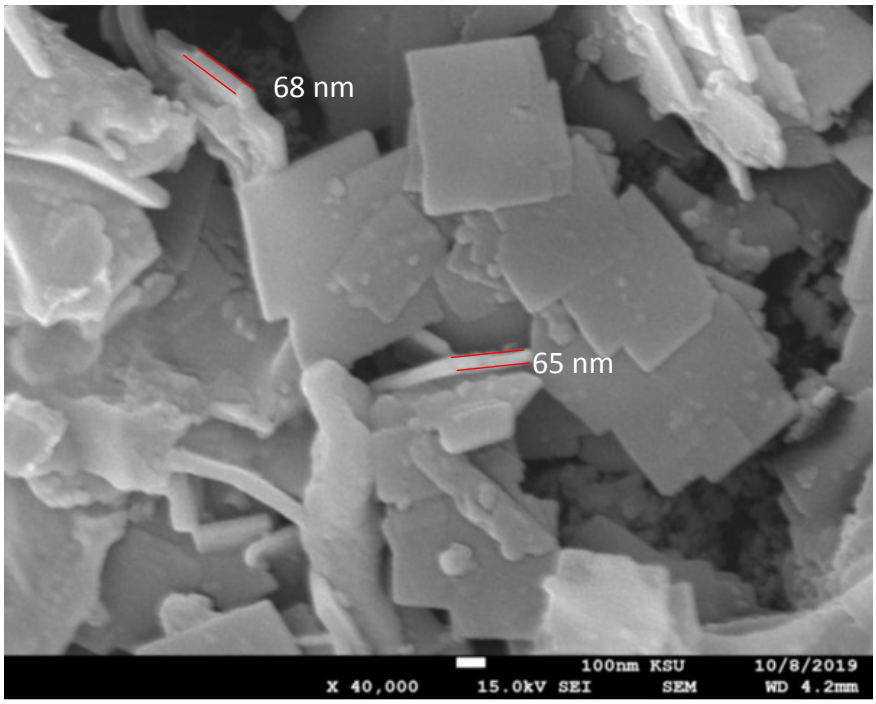

Fig. S1 High magnification image of KNiAlF6 nanosheet showing the thickness of the nanosheets estimated at about 60 to 70 nm.

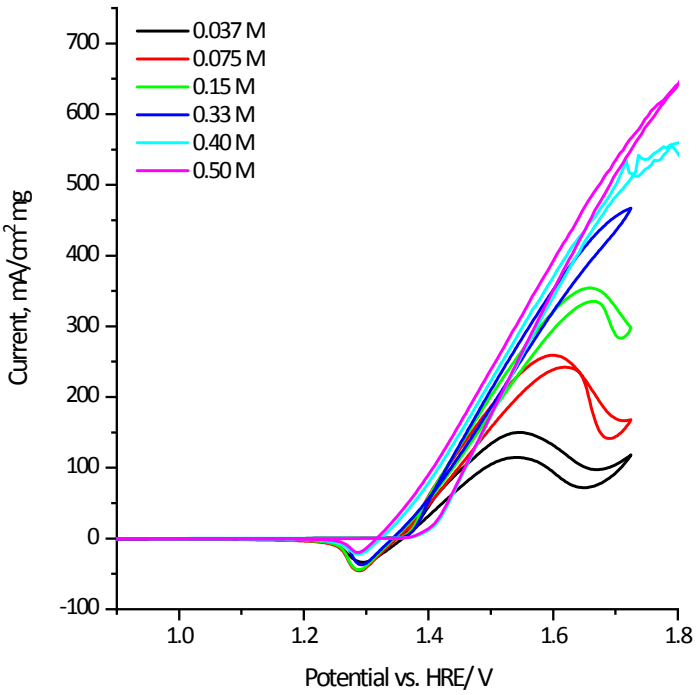

Fig. S2 Cyclic voltammograms of 100 µg of the $KNiAlF_6$ catalyst recorded at 50 mV s^{-1} in 1.0 M KOH containing various concentrations of urea (0.0375, 0.075, 0.15, and 0.33 , 0.40 and 0.50 M).

Further increase of urea concentration above 0.33 M showed a small current enhancement in urea oxidation presumably because the reaction follows the EC mechanism and the competitive adsorption of urea with hydroxide ion at the catalyst surface decreases the generation rate of NiOOH species that mediates the urea oxidation in the chemical step. Therefore, an optimum ratio of urea/hydroxide concentration should be maintained to achieve the highest urea oxidation current.

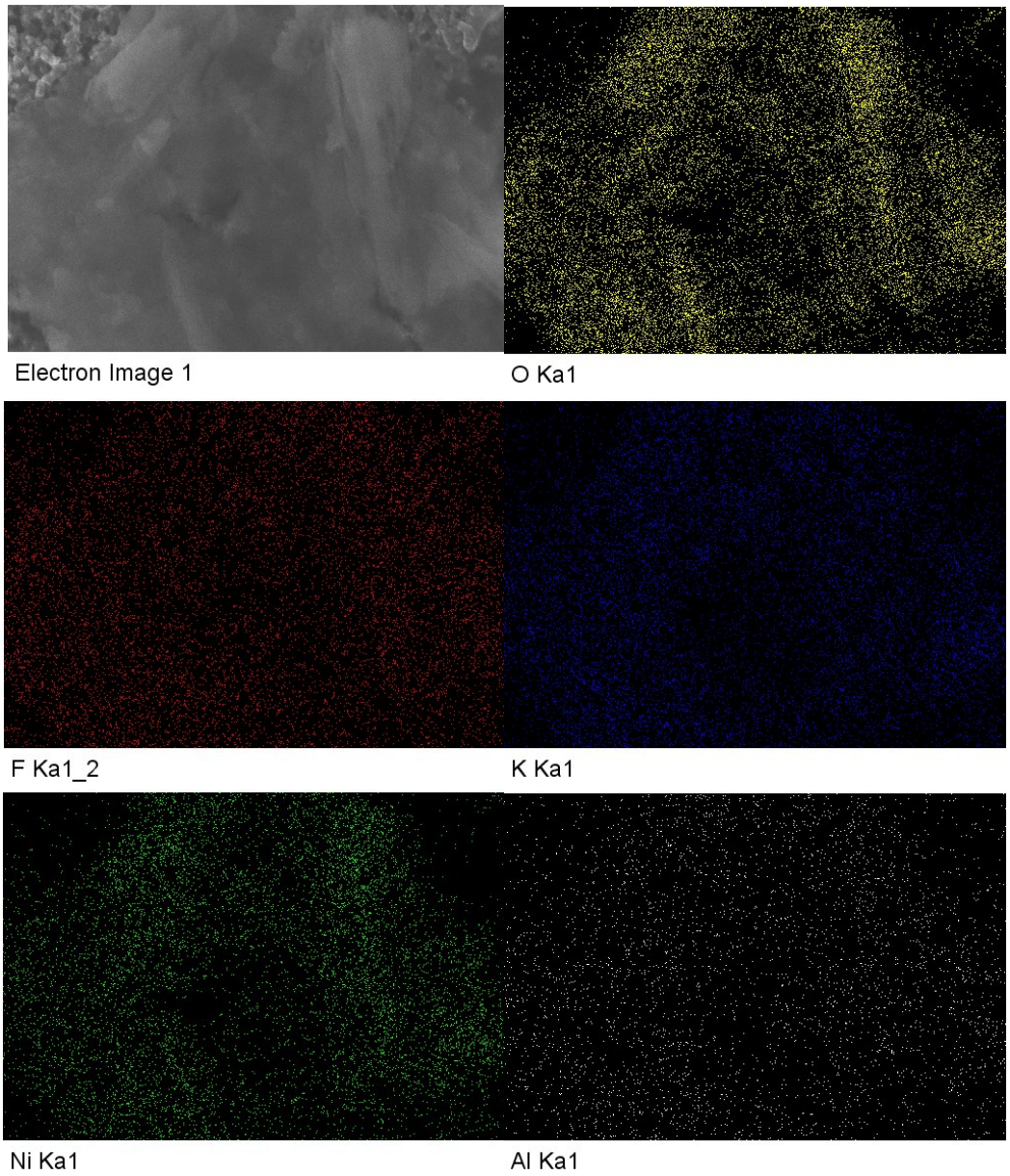

Fig. S3 SEM image and the corresponding X-ray elemental mapping of the KNiAlF6 catalyst after been used in urea oxidation at 60 °C for 3.0 hours

Table S1 the EDX composition analysis of the $KNiAlF_6$ catalyst after and before been used in urea electrolysis.

Element	Wt.% After use	Wt. % Before use
O K	28.27	5.35
F K	28.55	51.8
Al K	9.35	10.75
K K	9.18	11.83
Ni K	24.65	25.62
Totals	100.00	