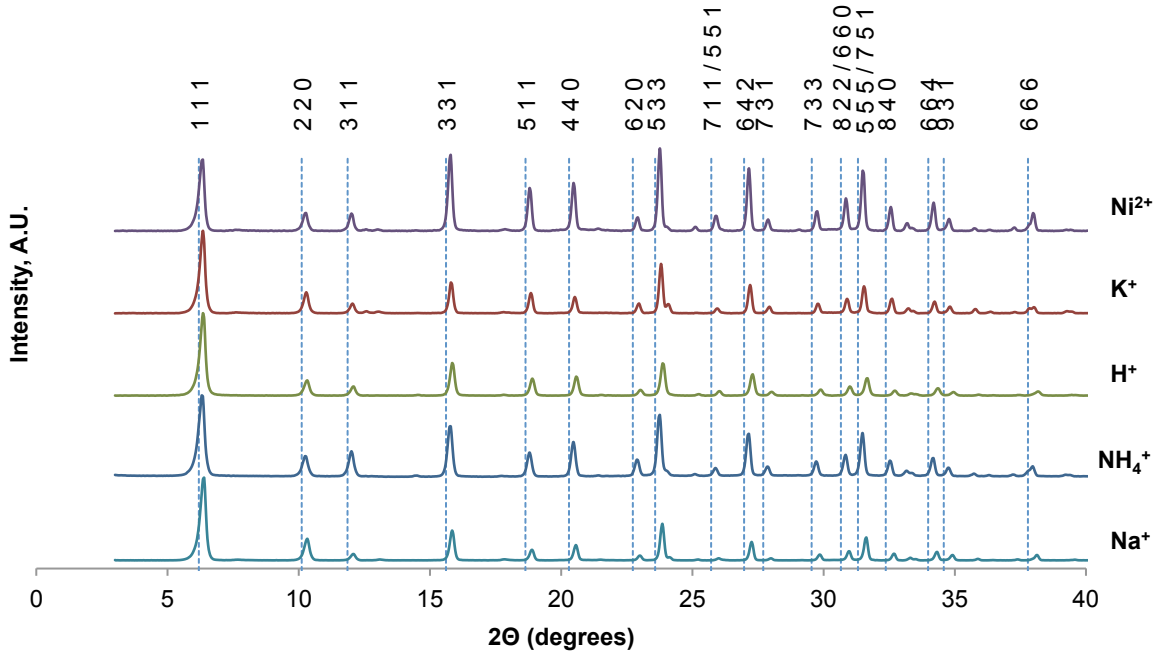
Supplementary information for:

Zeolite Y supported nickel phosphide catalysts for the hydrodenitrogenation of quinoline as a proxy for algal bio-oils

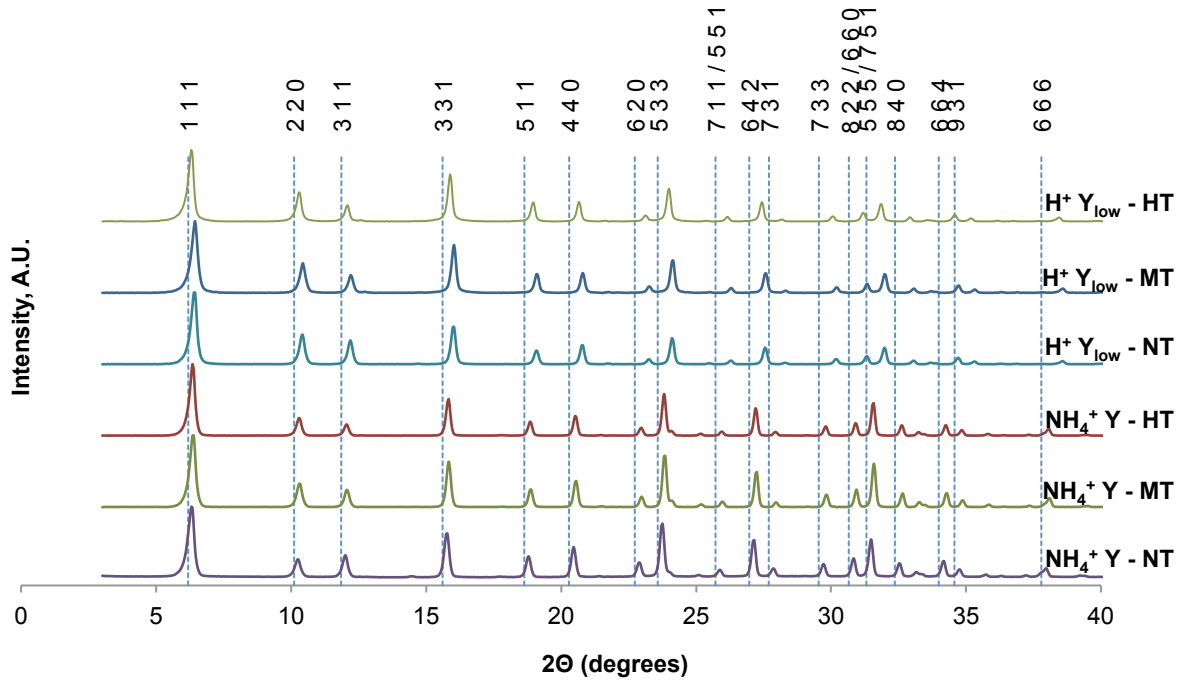
Jonathan L. Wagner,[a,b] Emyr Jones, [c] Asel Sartbaeva,[c] Sean A. Davis,[d] Laura Torrente-Murciano,[e] Christopher J. Chuck[b] Valeska P. Ting[f]

1.1 X-Ray powder diffraction patterns

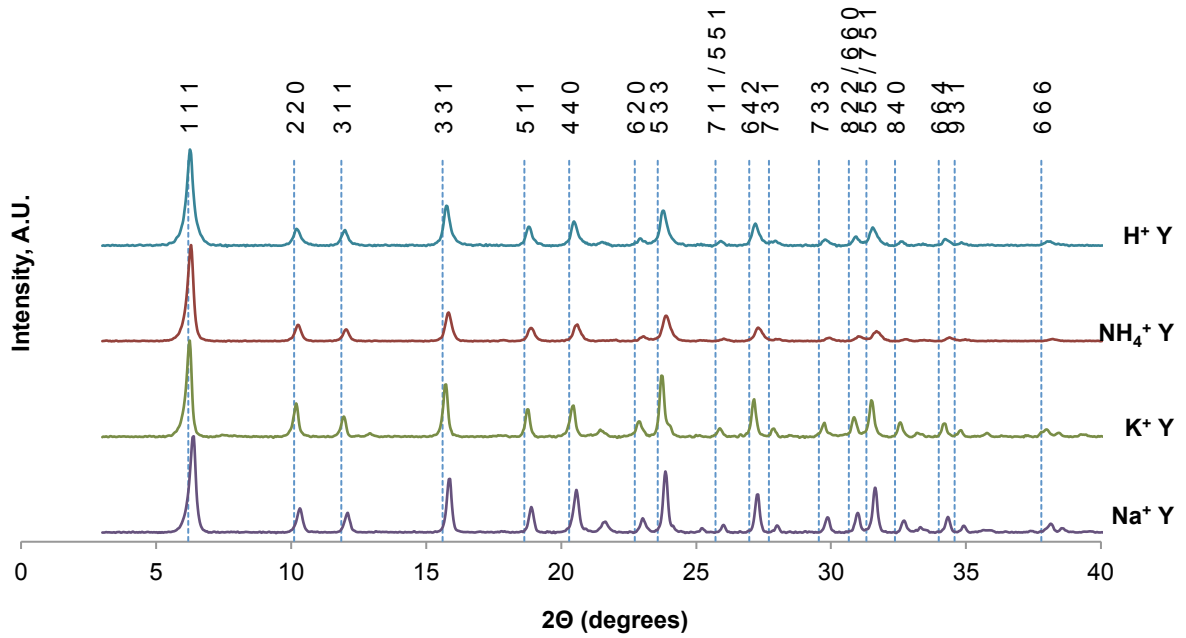
1.1.1 Ion-exchanged zeolites



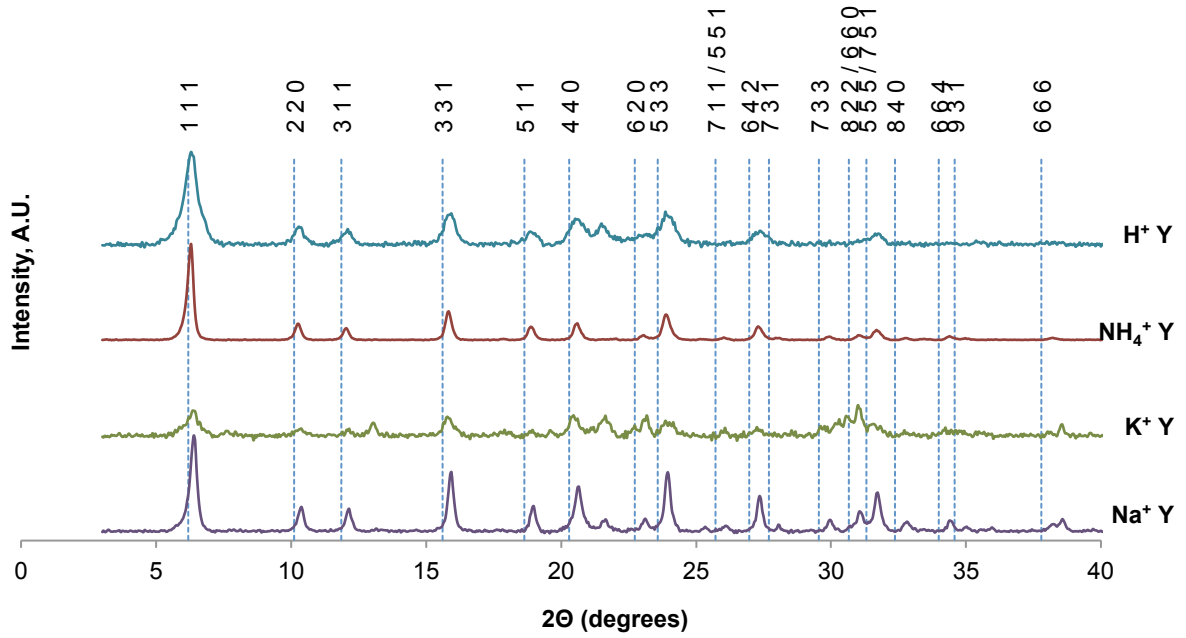
1.1.2 Base-treated zeolites



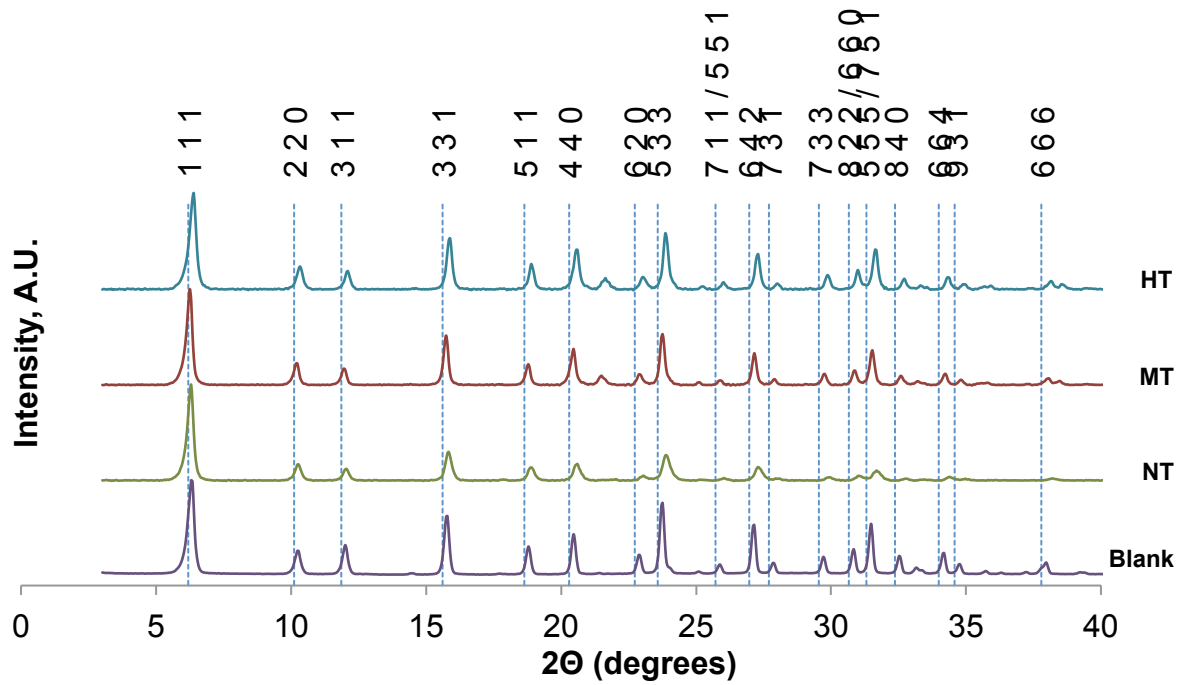
1.1.3 Ni-P catalysts prepared by single step impregnation



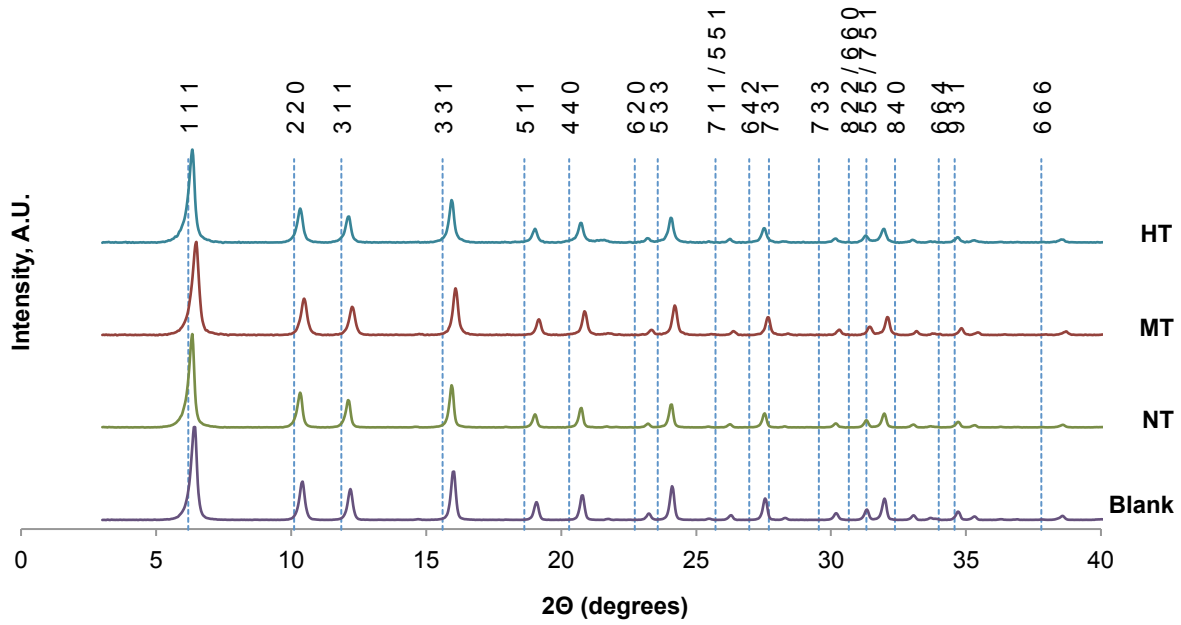
1.1.4 Ni-P catalysts prepared by two-step impregnation



1.1.5 Ni-P catalysts supported on base-treated NH_4^+ Y zeolite (single-step impregnation)



1.1.6 Ni-P catalysts supported on base-treated H^+ Y_L zeolite (single-step impregnation)


Intensity, A.U.
1 1 1
2 2 0
3 1 1
3 3 1
5 1 1
4 4 0
6 2 0
5 3 3
7 1 1 / 5 5 1
6 4 2
7 3 1
7 3 3
8 2 2 / 6 6 0
5 5 1 / 7 5 1
8 4 0
6 6 4
9 3 1
6 6 6
HT
MT
NT
Blank
0
5
10
15
20
25
30
35
40
2Θ (degrees)

1.2 Conversion product of quinoline over Ni^{2+} Y zeolite from ^{13}C NMR. Theoretical peaks are listed on the left, whereas the actual peaks are assigned to each product and missing peaks are denoted by an X.

Theoretical peaks	1234THQ	5678THQ	OPA	tDHQ	cDHQ	PCH	PB
157.28		x					
146.73		x					
144.80	144.66						
144.14			x				
136.60		x					
132.12		x					
129.48			129.40				
129.40	129.40						
126.83			x				
126.65	126.62						
126.64			126.62				
121.26	121.28						
120.80		120.93					
118.62			x				
116.77	116.88						
115.49			x				
114.12	114.08						
53.28				x			
50.49					x		
47.31				x			
45.52					x		
43.85				x			
42.52				x			
41.93	41.92						
40.04						x	
37.56						x	
36.54					x		
34.74					x		
34.43				x			
33.64				x			
33.58						x	
33.33			x				
32.52		x					
30.57				x			
30.11					x		
28.86					x		
28.73		28.69					
27.00	26.91						
26.89						26.91	
26.85					x		
26.61						x	
26.53				x			
26.31				x			
25.05					x		
23.09		x					
22.90					x		
22.71		x					
22.17	22.16						
21.86							
20.04						x	
14.46						14.36	
14.13			x				

1.3 SEM analysis of base treated $H^+ Y_L$ zeolite samples. (a) untreated zeolite, (b) and (c) zeolite following harsh chemical treatment, displaying small surface defects