

1 Supplementary Information for

2 **Bi/AC modified with phosphoric acid as catalyst in the hydrochlorination of**

3 **acetylene**

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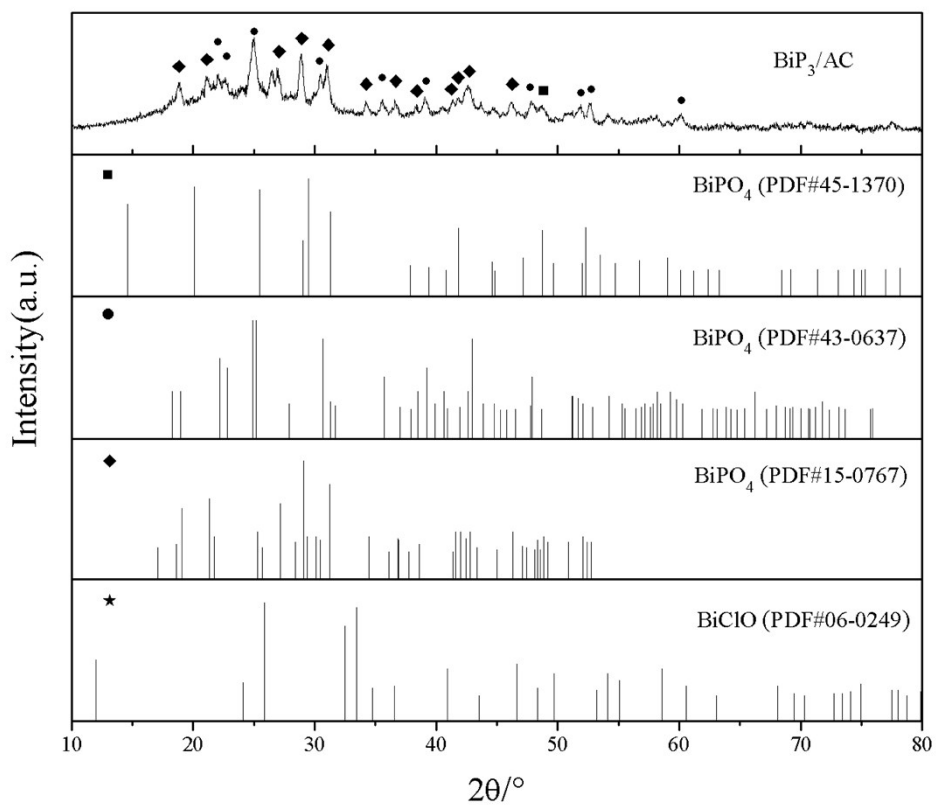
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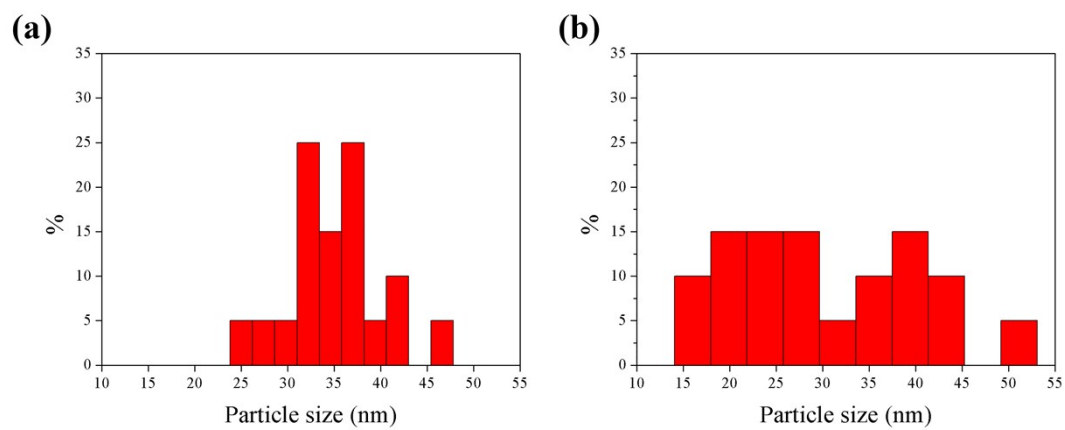
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19 **Fig. S1.** XRD pattern of fresh BiP_3/AC catalyst



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22 **Fig. S2.** Particle distribution of fresh Bi/AC (a) and BiP_{0.5}/AC.

24 **Table S1**

25 Metal particle size of Bi-based catalysts caculated from Scherrer's formula

Catalyst	$2\theta \pm 0.01$	<i>hkl</i>	FWHM (degree)	Metal particle size (nm)
Bi/AC	25.88	(101) ^a	0.210	38.4
BiP _{0.1} /AC	25.76	(101) ^a	0.221	36.5
BiP _{0.5} /AC	25.90	(101) ^a	0.230	35.1
BiP ₁ /AC	28.84	(120) ^b	0.295	27.5
BiP ₂ /AC	29.09	(120) ^b	0.218	37.2
BiP ₃ /AC	24.96	(101) ^a	0.462	17.4

26 a: Tetragonal BiOCl JPCDS 06-0249

27 b: Monoclinic BiPO₄ JPCDS 15-0767

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29 Scherrer's formula:

$$30 \quad D = \frac{0.9\lambda}{\beta \cos \theta};$$

31 Where λ is the radiation wavelength, θ is the Bragg angle of selected peak, and β is

32 FWHM value.

34 **Table S2**35 Structural characteristics and catalytic properties of the as-prepared catalysts^a

Samples	Content of Bi (%)	Conversion (%)	S _{BET} (m ² /g cat.)	B _{C₂H₂^m} (h ⁻¹ ·g ⁻¹ Bi)	B _{C₂H₂^S} (h ⁻¹ ·m ⁻² cat.)
Bi/AC	16.4	68.7%	288	44.7	0.025
BiP _{0.1} /AC	15.7	58.5%	93	39.8	0.067
BiP _{0.5} /AC	15.8	82.8%	346	55.9	0.026
BiP ₁ /AC	15.5	80.2%	315	55.2	0.027
BiP ₂ /AC	15.6	61.9%	64	42.3	0.103
BiP ₃ /AC	15.2	41.4%	55	29.1	0.080

36 ^a Reaction conditions: 5 g Bi-based catalysts, GHSV = 120 h⁻¹, temperature (T) =37 160°C, feed volume ratio V(HCl) / V(C₂H₂) = 1.25.