Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

POSS-derived solid acid catalysts with excellent hydrophobicity for highly efficient transformations of glycerol

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Supplementary figures

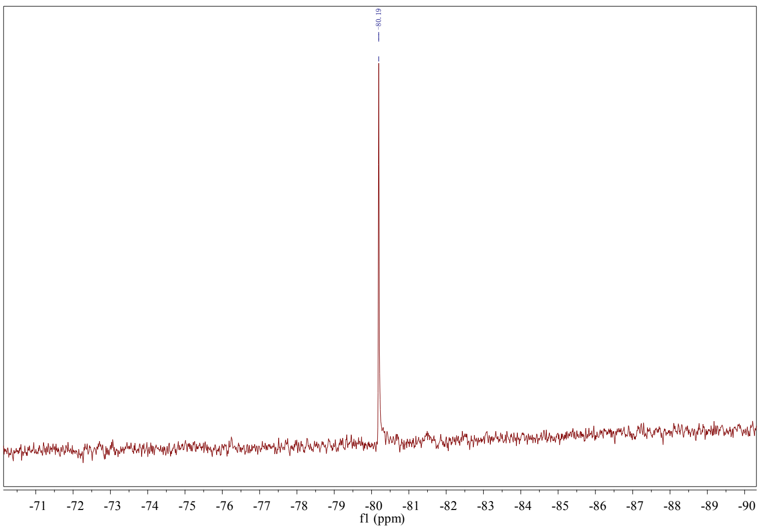

Figure S1. ^{29}Si NMR spectra of octavinyl POSS.

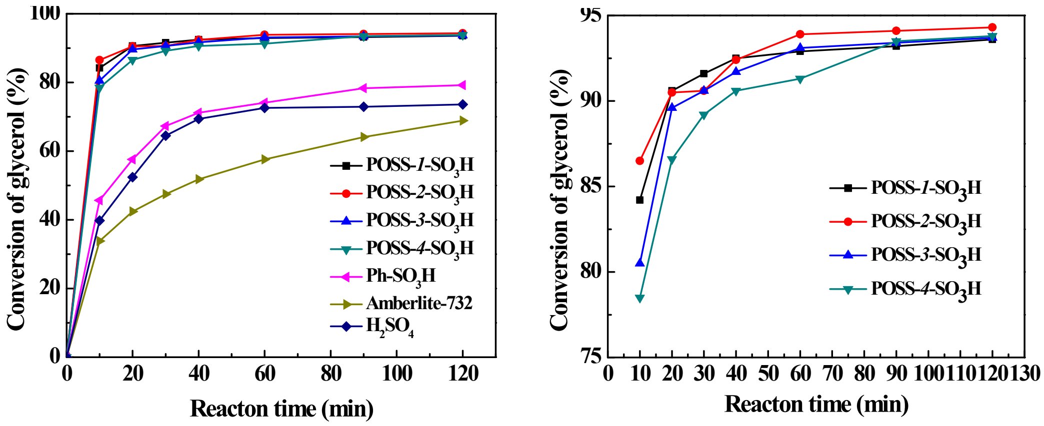

Figure S2 Catalytic kinetics of catalysts in the acetalization of glycerol with PhCHO.

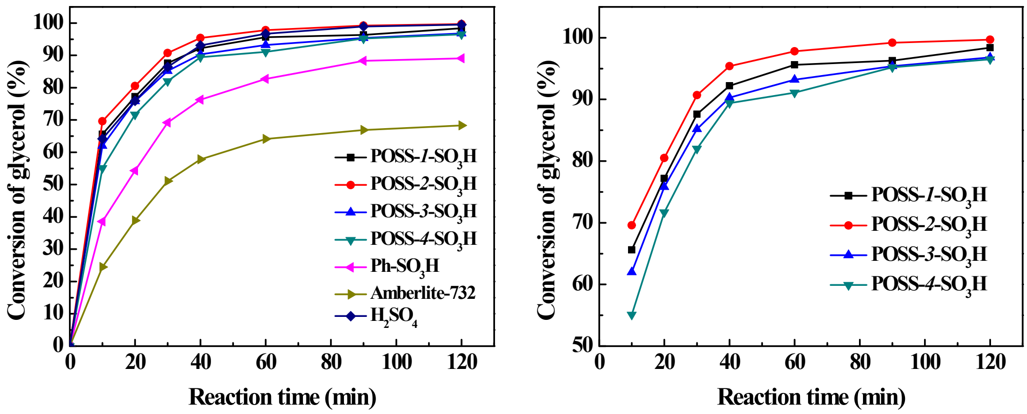

Figure S3 Catalytic kinetics of catalysts in esterification of glycerol with acetic acid.

Table 1. Catalytic activities of catalysts for the acetalization of glycerol with PhCHO and esterification of glycerol with acetic acid.

Catalyst	Time (min)	Glycerol/Benzaldehyde			Glycerol/Acetic acid		
		Con (%)	1,3-Dioxolane (%)	1,3-Dioxane (%)	Con (%)	DAG (%)	TAG (%)
POSS-1-SO_3H	10	84.2	48.3	43.2	65.6	87.6	6.5
	20	90.6	51.2	42.5	77.2	86.9	8.3
	30	91.6	54.9	38.2	87.6	86.6	10.1
	40	92.5	65.4	26.7	92.2	83.7	14.3
	60	92.9	59.4	33.6	95.6	85.2	12.7
	90	93.2	68.7	24.2	96.3	86.4	11.9
	120	93.6	72.8	20.5	98.4	85.6	13.4
POSS-2-SO_3H	10	86.5	48.4	43.5	69.6	89.8	4.7
	20	90.5	51.4	35.6	80.5	91.3	7.6
	30	90.6	52.8	39.1	90.7	85.2	10.2
	40	92.4	54.9	36.6	95.4	86.0	11.8
	60	93.9	53.9	37.2	97.8	87.2	10.9
	90	94.1	55.1	36.3	99.2	86.7	12.1
	120	94.3	55.7	36.5	99.7	86.4	12.3
POSS-3-SO_3H	10	80.5	56.8	37.8	62	84.2	12.2
	20	89.6	57.5	35.7	75.8	82.9	14.7
	30	90.6	56.9	37.4	85.2	83.3	14.2
	40	91.7	57.3	36.8	90.3	83.7	14.5
	60	93.1	58.7	35.6	93.2	82.3	15.5
	90	93.4	60.3	32.1	95.4	81.4	17.2
	120	93.7	64.4	30.8	96.8	78.6	19.8

Table 1 continued

Catalyst	Time (min)	Glycerol/Benzaldehyde			Glycerol/Acetic acid		
		Con (%)	1,3-Dioxolane (%)	1,3-Dioxane (%)	Con (%)	DAG (%)	TAG (%)
POSS-4-SO_3H	10	78.5	53.9	40.2	55.1	79.3	17.5
	20	86.6	56.3	35.5	71.7	80.3	16.9
	30	89.2	57.2	35.0	82.0	80.7	18.2
	40	90.6	58.1	33.9	89.4	78.3	19.9
	60	91.3	57.4	34.3	91.1	79.6	18.3
	90	93.5	61.3	31.1	95.2	78.5	19.6
	120	93.8	59.2	32.6	96.5	77.1	21.5
Ph-SO_3H	10	45.7	70.2	28.5	38.6	88.6	8.2
	20	57.6	68.7	29.4	54.3	86.9	9.3
	30	67.3	66.5	31.9	69.2	86.6	10.1
	40	71.2	67.2	31.4	76.3	87.1	11.3
	60	74.1	64.9	33.7	82.7	85.2	12.9
	90	78.3	66.2	32.0	88.3	86.3	11.7
	120	79.2	65.4	33.5	89.1	85.2	13.2
Amberlite-732	10	33.8	55.3	43.8	24.5	85.3	11.6
	20	42.4	54.7	44.9	38.9	84.9	12.7
	30	47.5	57.1	41.3	51.1	83.3	14.1
	40	51.8	55.6	41.7	57.8	83.8	14.3
	60	57.6	56.9	40.9	64.1	82.6	15.4
	90	64.1	57.3	40.7	66.9	81.7	17.5
	120	68.9	57.9	39.5	68.3	80.9	18.2
H_2SO_4	10	39.8	56.3	37.9	64.2	51.6	47.5
	20	52.4	57.1	36.0	75.9	49.3	49.8
	30	64.5	57.9	36.5	86.4	49.5	49.7
	40	69.4	57.7	36.1	93.1	47.9	51.0
	60	72.6	58.1	36.7	96.7	48.2	50.1
	90	72.9	58.3	36.2	98.9	47.3	51.8
	120	73.6	57.9	39.5	99.5	45.3	54.1