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Electronic Supplementary Information (ESI)

Selective sorption of palladium by thiocarbamoyl–substituted thiacalix[*n*]arene derivatives immobilized in amberlite resin: Application to leach liquors of automotive catalysts

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Supporting Information- Table of content

Table S1 Physical and chemical properties of XAD resin.

Constituents	
Matrix structure	Acrylic
Classification	Nonionic Spherical
Specific surface area (m^2/g)	500
Pore volume (cm^3/g)	0.6
Pore diameter (Å)	100
Apparent density (g/L)	~655
Moisture holding capacity (%)	61-69
Harmonic mean diameter (mm)	0.43 - 0.69
Uniformity coefficient	≦ 2.0
Effective pH range	0-14
Polarity	Intermediate polarity

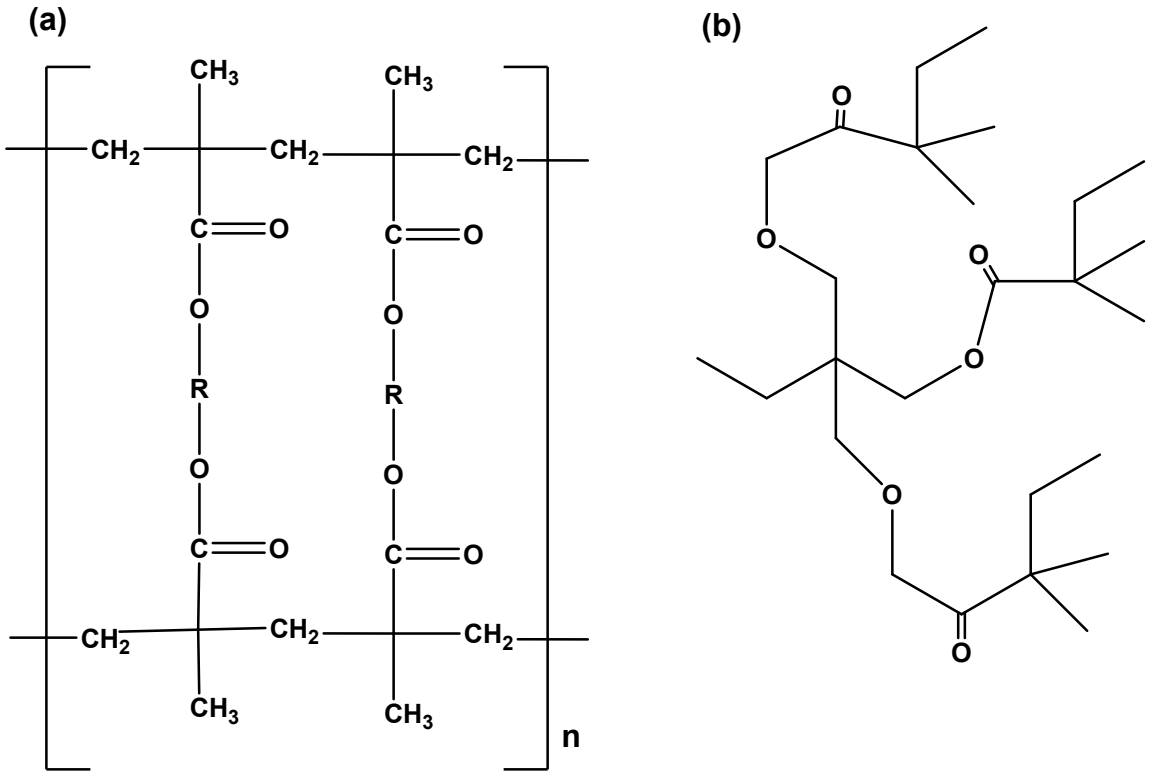


Fig. S1 (a) The chemical structure of XAD and (b) cluster model of XAD surface.

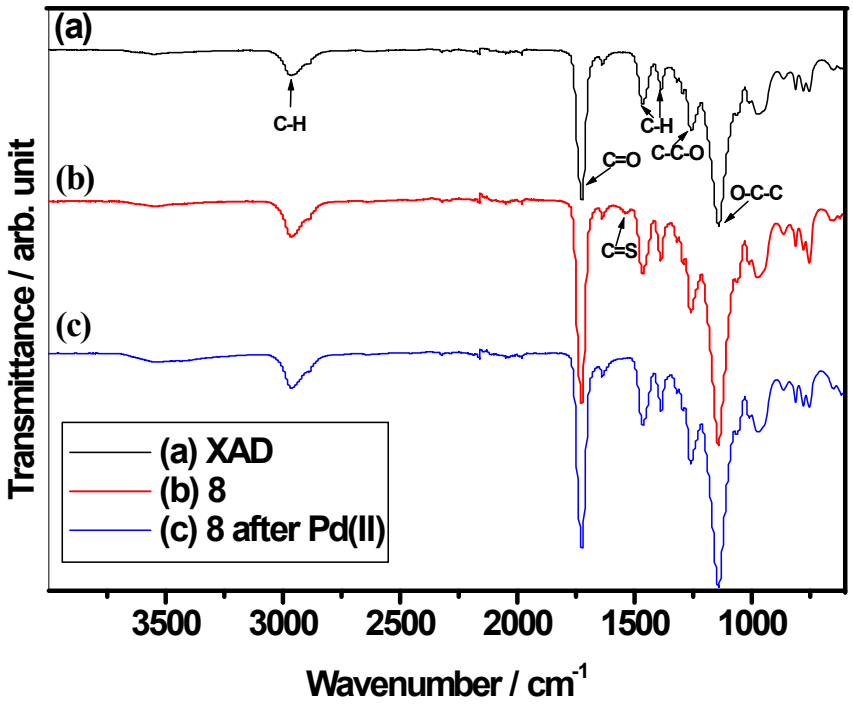


Fig. S2 FT-IR spectra of XAD, **8** and Pd(II) sorbed **8**.

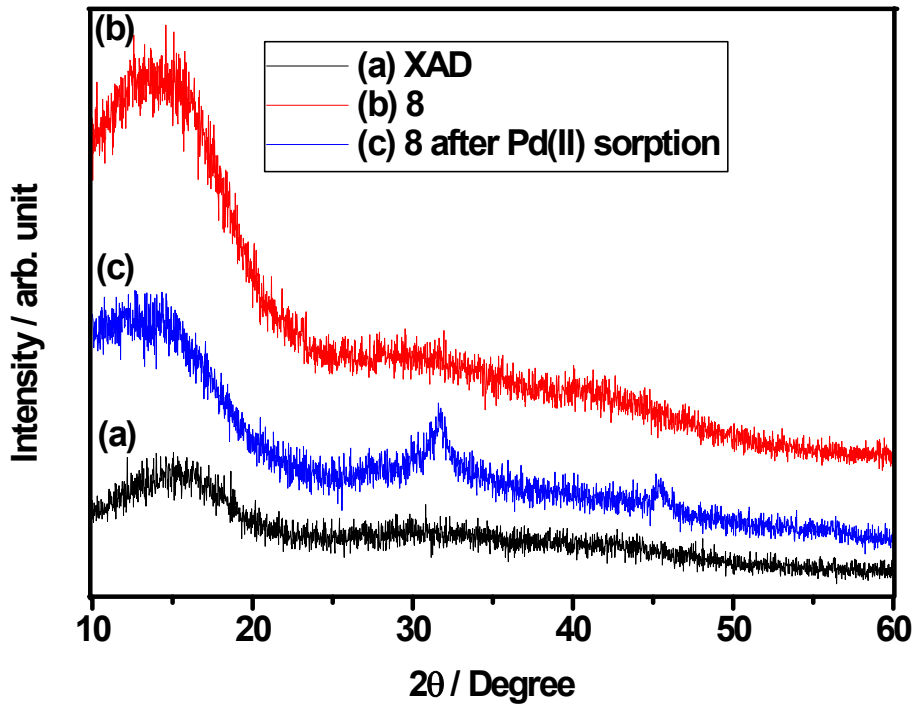


Fig. S3 XRD patterns of XAD, **8**, and Pd(II) sorbed **8**.

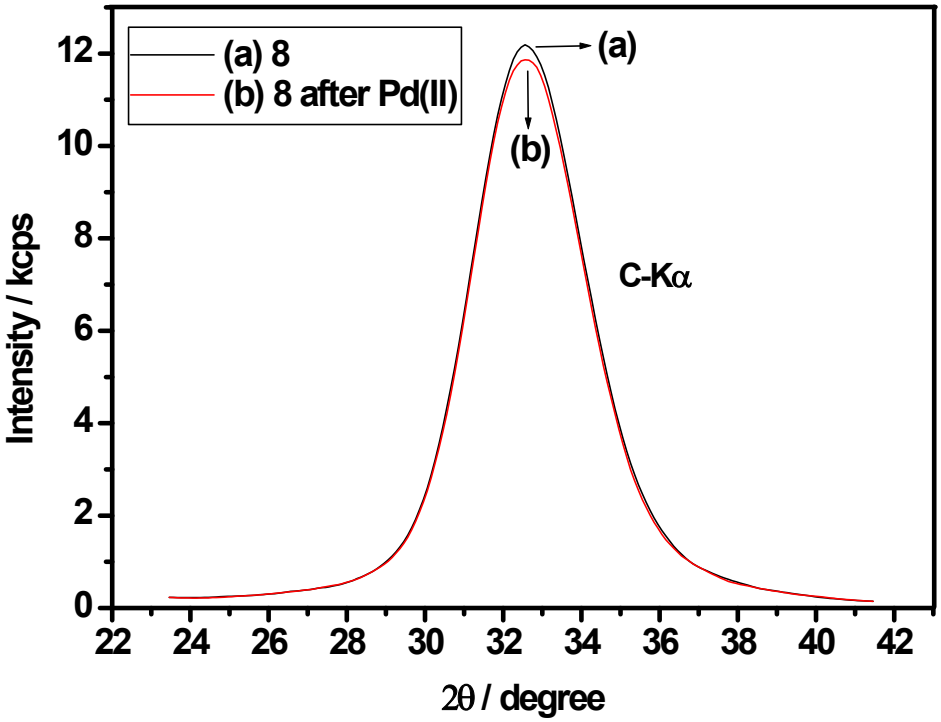


Fig. S4 (a-b) WDXRF spectra of C Kα for **8** before and after Pd(II) sorption

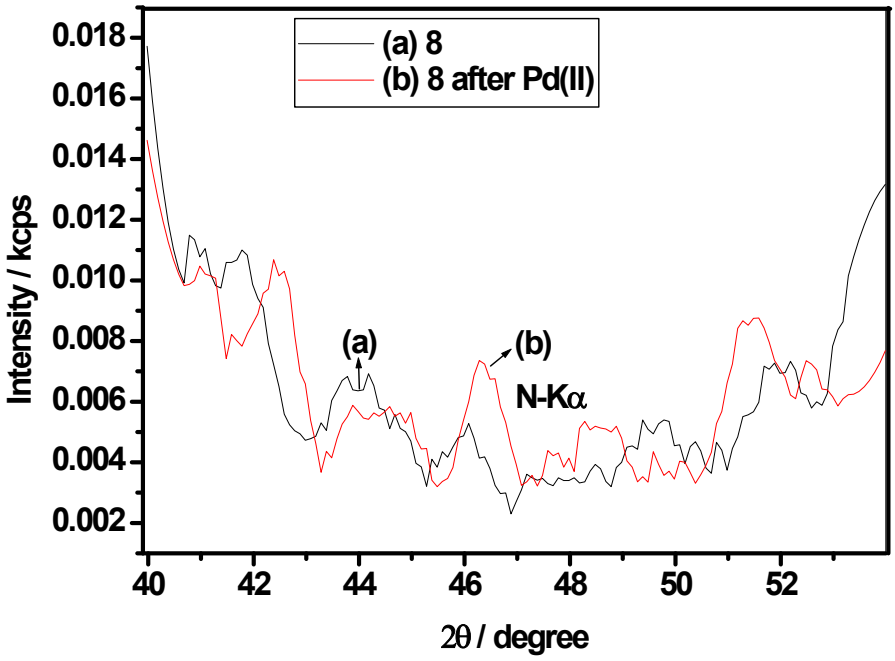


Fig. S5 (a-b) WDXRF spectra of N Kα for **8** resin before and after Pd(II) sorption.

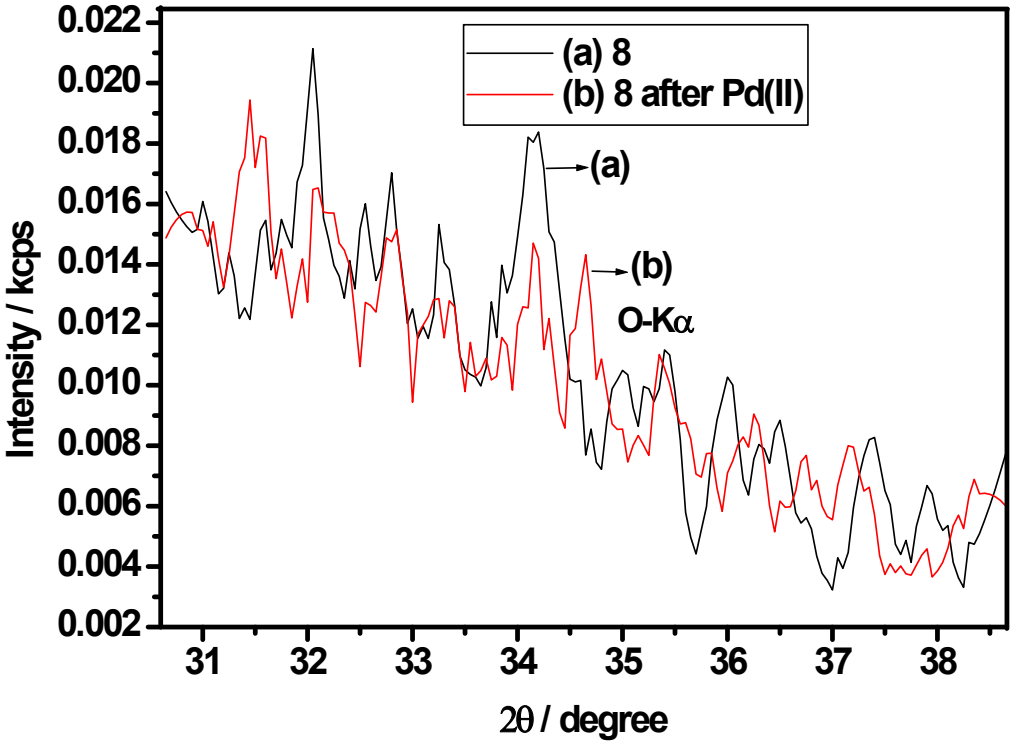


Fig. S6 (a-b) WDXRF spectra of O Kα for **8** resin before and after Pd(II) sorption.

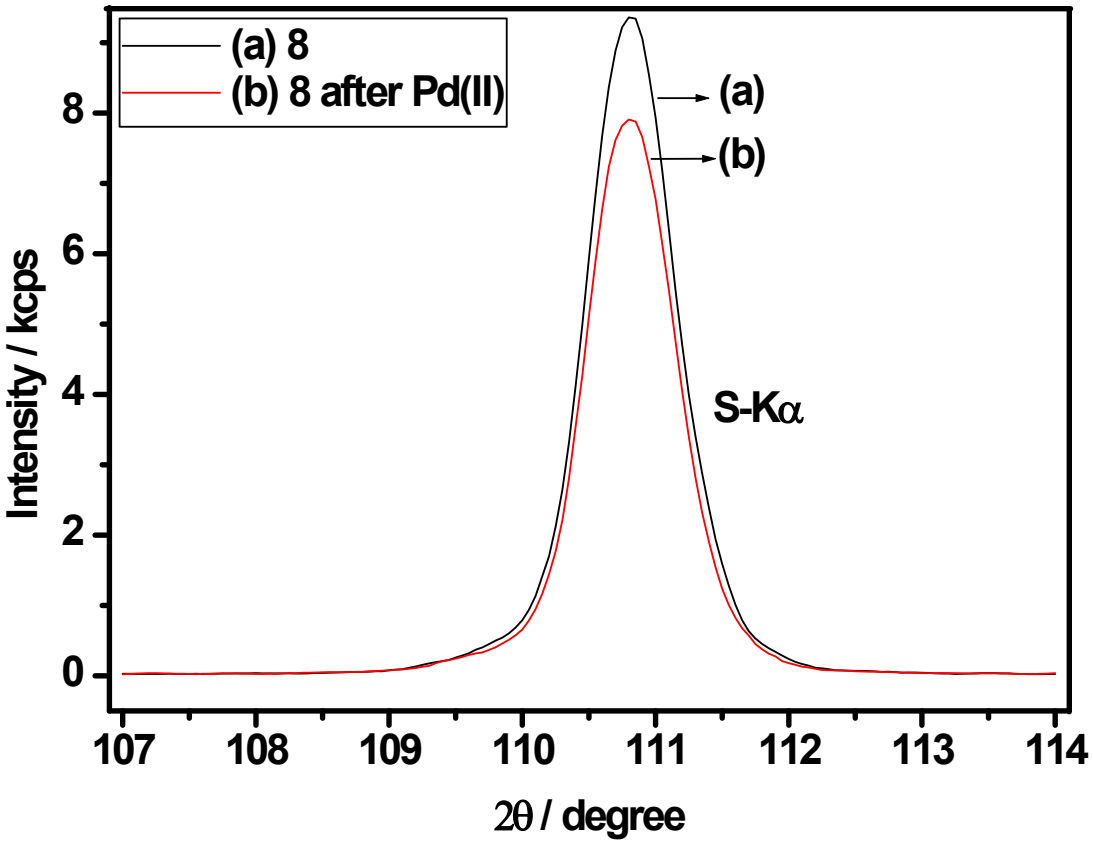
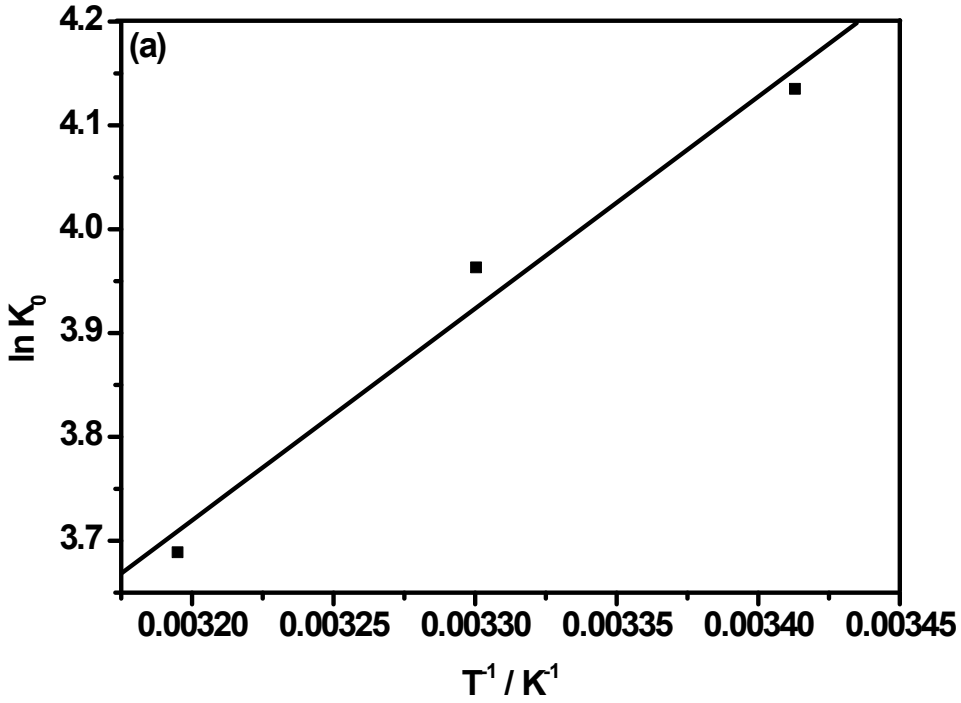


Fig. S7 (a-b) WDXRF spectra of S Kα for **8** resin before and after Pd(II) sorption.



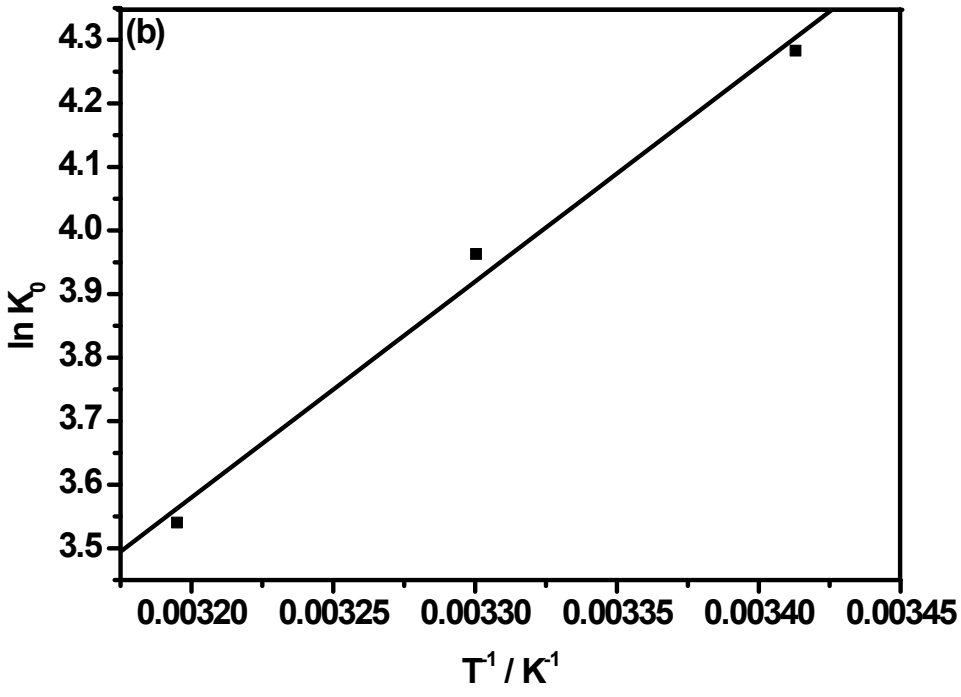


Fig. S8 Van't Hoff plot relating ln K against 1/T (a) **7** (b) **8**.

Table S2 Thermodynamic parameters of **7** and **8**.

Thermodynamic		**7**	**8**
ΔG^o (kJ mol^{-1})	303 K	-10.07	-10.43
	313 K	-9.96	-9.98
	323 K	-9.59	-9.21
ΔH^o (kJ mol^{-1})		-16.96	-28.25
ΔS^o (kJ mol^{-1}K^{-1})		-0.023	-0.060

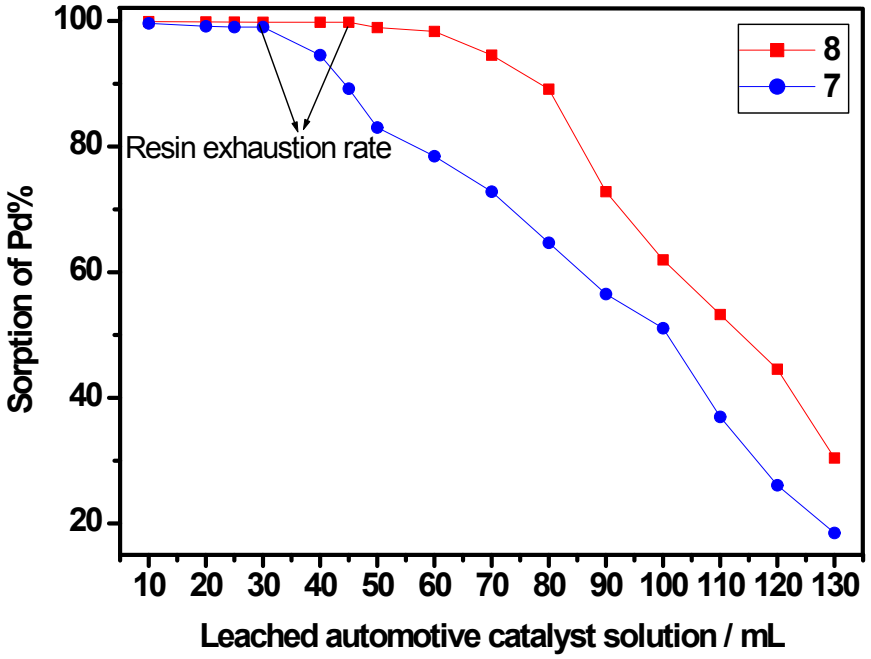


Fig. S9 Effect of automotive catalyst volume. Bed height = 0.5 cm; flow rate = 0.1 mL/min; [Pd(II)] in automotive catalyst solution = 9.2 mg/L.

Table S3 A comparison of the SCs of a few reported polymers for Pd(II) removal.

S. No	Polymeric adsorbents	Sorption capacity (mg/g)	Ref.
1	Diaion WA21J	5.7	16a
2	Melamine-formaldehyde-thiourea (MFT) resin	15.2	16b
3	Duolite GT-73	27.7	16c
4	Thiourea-Formaldehyde Chelating Resin (PTF1)	30.7	16d
5	Thiourea-Formaldehyde Chelating Resin (PTF2)	49.8	16d
6	Phosphine sulphide-chelating polymer (Polymer **3**)	53.0	16e
7	Duolite GT-73	21.2	17a
8	Calix[4]pyrrole[2]thiophene immobilized polymer	65.0	17b
9	POLYORGS V	18.4	17c
10	POLYORGS VI	48.0	17c
11	Polythioether resin with aminoisopropyl-mercaptan	64.8	17d
12	Spheron Oxine 1000	57.0	17e
13	Spheron Salicyl 1000	10.0	17e
14	Spheron 1000	1.6	17e
15	Dithizone modified chloromethylated polystyrene	72.1	18a
16	Amidinothioureido-silica gel	14.9	18b
17	Benzimidazolylazo resin	65.7	18c
18	Lewatit MP-500	9.9	18d
19	Lewatit MP-500A	9.4	18d
20	TUF resin	31.8	18e
21	Purolite S-940	53.2	19a
22	Amberlite XAD-7 impregnated Cyphos IL-101	71.0	9b
23	Triisobutyl phosphine sulfide resin (Polymer A)	54.0	19b
24	Triisobutyl phosphine sulfide resin (Polymer A)	76.3	19b
25	IRA 910	81.6	19b
26	Macroporous poly(vinyl-aminoacetone)	66.8	19c
27	Pyrazolone immobilized styrene-divinylbenzene	59.4	19d
28	**7**	51.55	Present study
29	**8**	91.74	Present study