

Supporting Information for

Room-temperature coalescence of Pd nanoparticles with sacrificial templates and sintering agents, and their catalytic activities in the Suzuki coupling reaction

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Supporting Information

Calibration curves of molar ratio (product/substrate) to peak area ratio (Fig. S1).

TEM image and particle size distribution of oleylamine-capped Pd NPs (Fig. S2).

TICs of the sacrifice templates and Pd NPs before and after the RT chemical sintering with the 10 mM KOH methanol solution (Fig. S3)

TGA curves of Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol in the presence of 29 mM HCl and 1.0 mM CTAC in a helium atmosphere. (Fig. S4)

Analysis of XPS spectra of Pd structures after the RT chemical sintering (Fig. S5)

XRD patterns of Pd structures after the RT chemical sintering (Fig. S6)

Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction in the cases using Pd structures prepared by various KOH concentrations (Fig. S7)

Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction in the cases using Pd structures prepared by various sintering agents (Fig. S8)

SEM images of porous Pd structure before and after the Suzuki coupling reaction in methanol (Fig. S9)

XPS spectra of porous Pd structure before and after the Suzuki coupling reaction in methanol (Fig. S10)

SEM images of porous Pd structure before and after the Suzuki coupling reaction in water (Fig.

S11)

Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction using various Pd catalysts (Fig. S12)

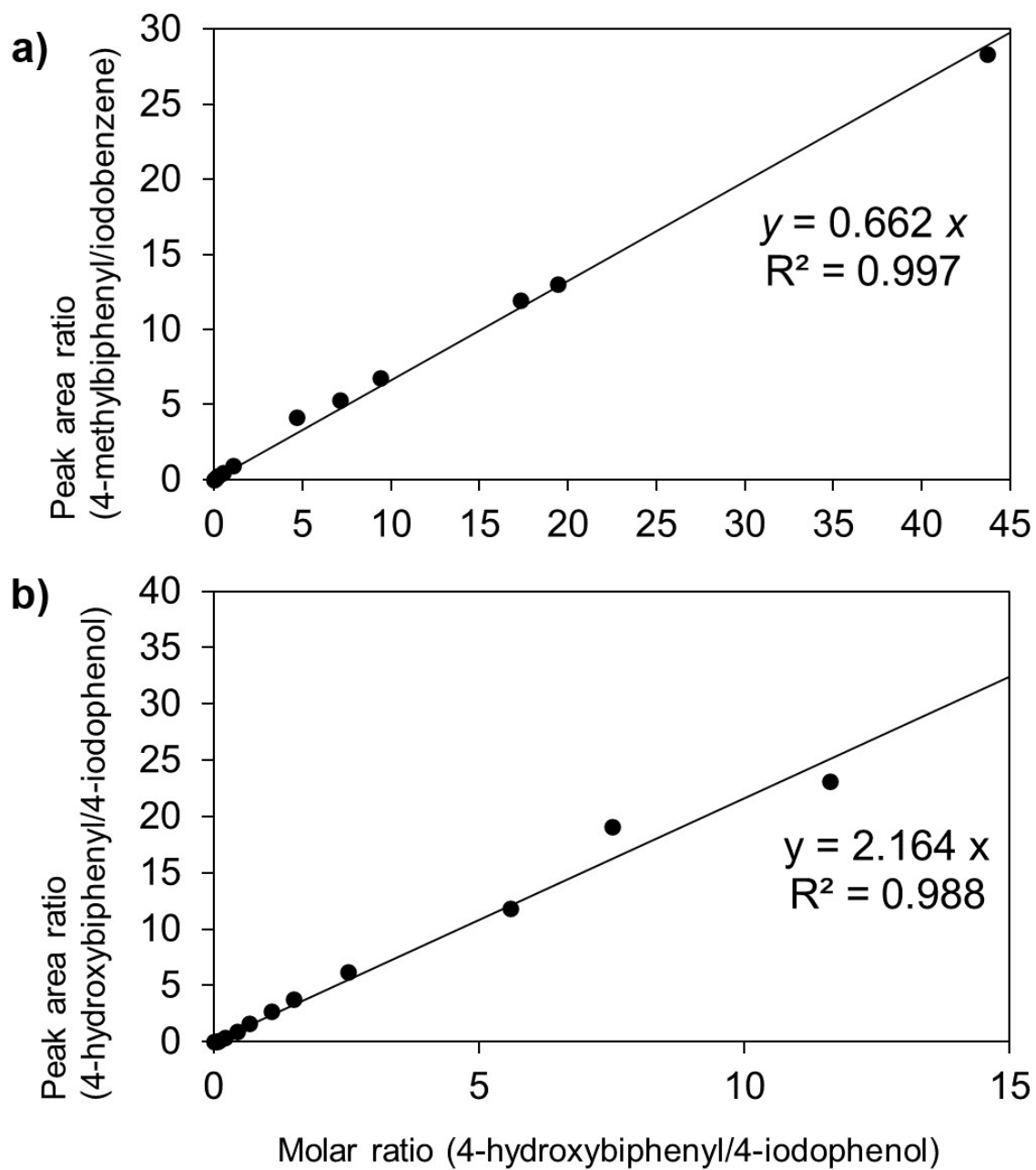


Fig. S1 Calibration curves of (a) iodobenzene to 4-methylbiphenyl and (b) 4-iodophenol to 4-hydroxybiphenyl in MC.

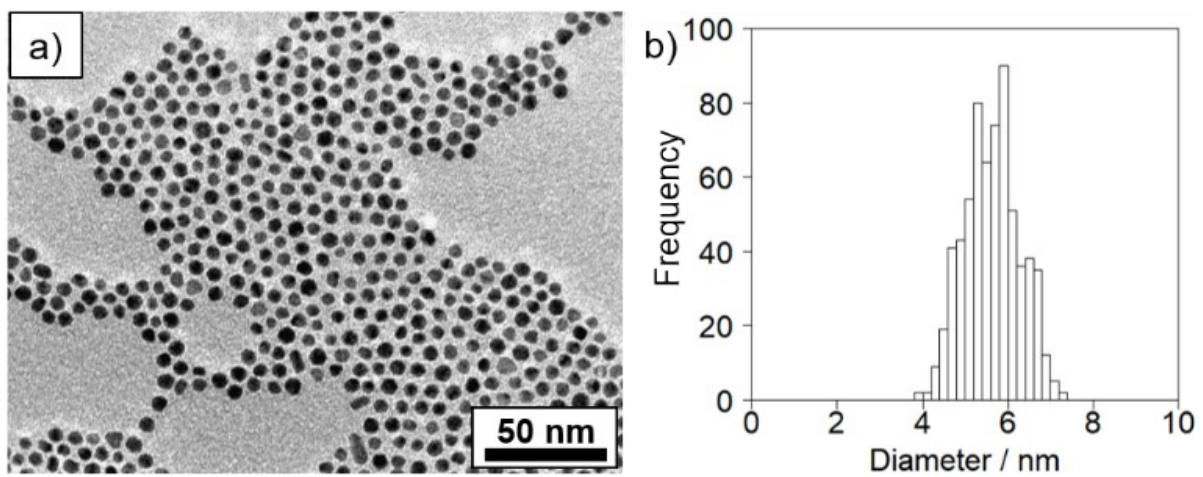


Fig. S2 (a) TEM image and (b) particle size distribution of oleylamine-capped Pd NPs.

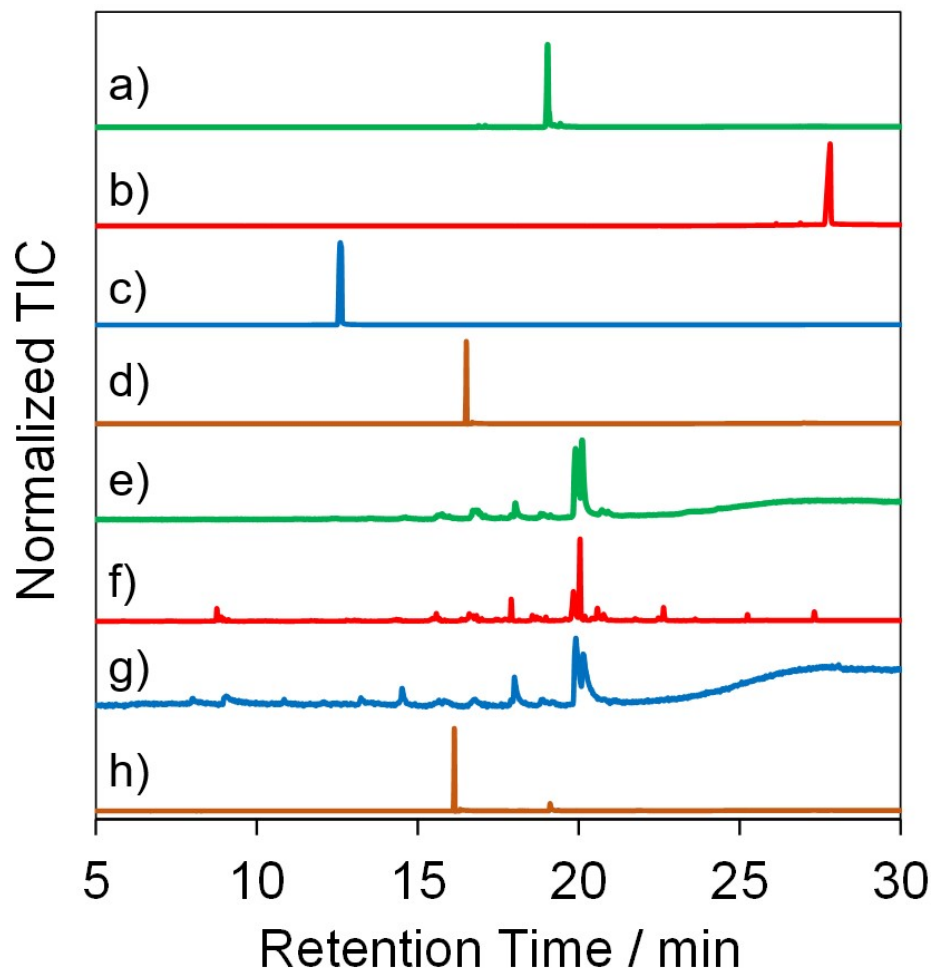


Fig. S3 TICs of (a) oleylamine, (b) TOPO, (c) 1-dodecanol, (d) *n*-octadecane, (e) oleylamine-capped Pd NPs, and Pd NPs mixed with (f) TOPO, (g) 1-dodecanol and (h) *n*-octadecane after washing with the 10 mM KOH methanol solution.

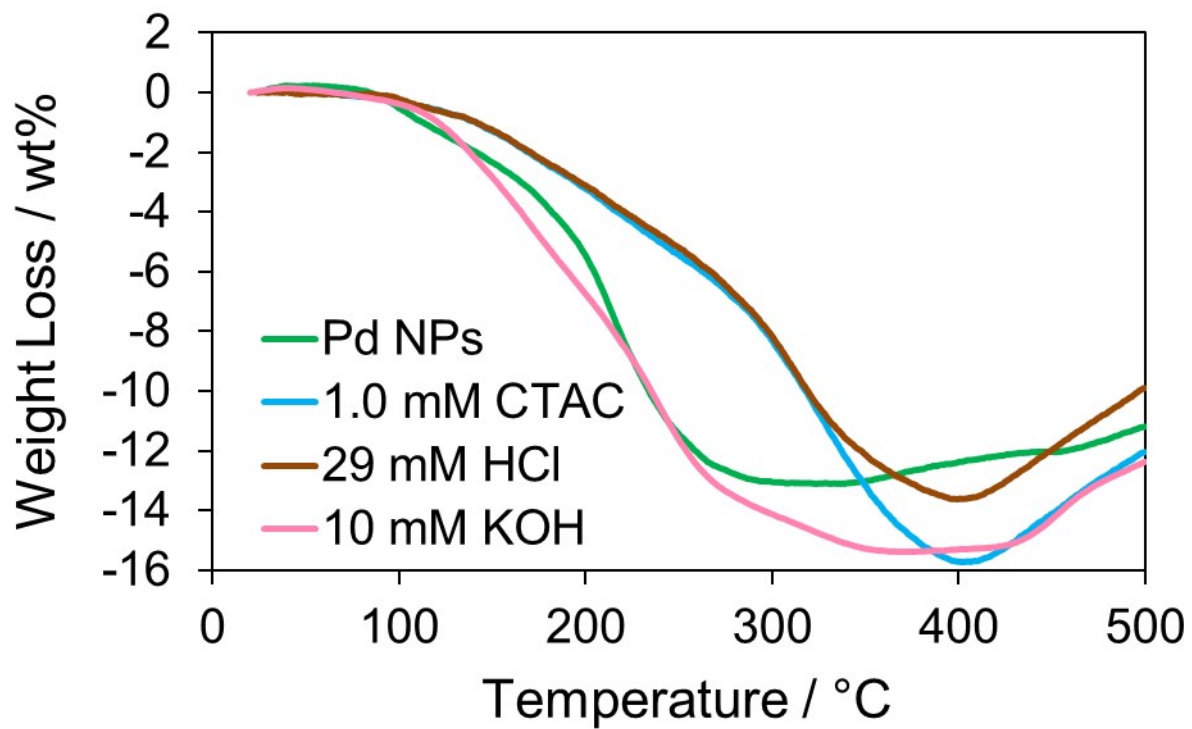


Fig. S4 TGA curves of Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol in the presence of 10 mM KOH, 29 mM HCl and 1.0 mM CTAC in a helium atmosphere.

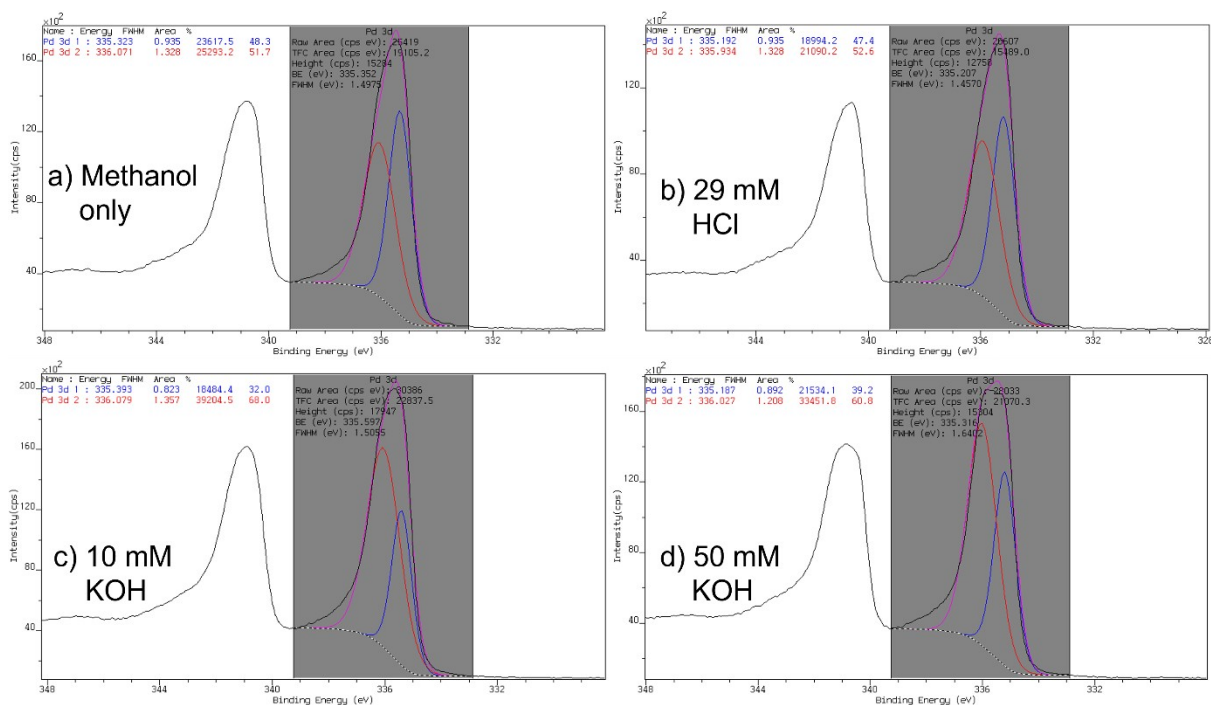


Fig. S5 Analysis of XPS spectra of Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol a) in the absence and the presence of b) 29 mM HCl, c) 10 mM KOH and d) 50 mM KOH.

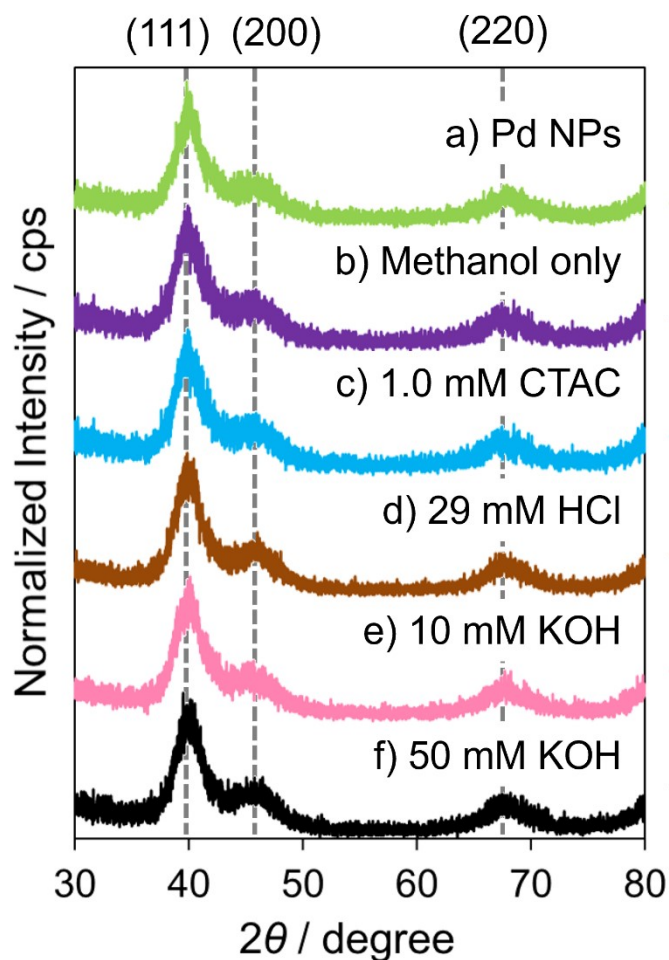


Fig. S6 XRD patterns of (a) oleylamine-capped Pd NPs and Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol in the (b) absence and presence of (c) 1.0 mM CTAC, (d) 29 mM HCl, (e) 10 mM KOH and 50 mM KOH. The diffraction peaks of Pd crystals are shown as dotted lines with reference to the paper (*Langmuir*, 2010, **26**, 6230-6239).

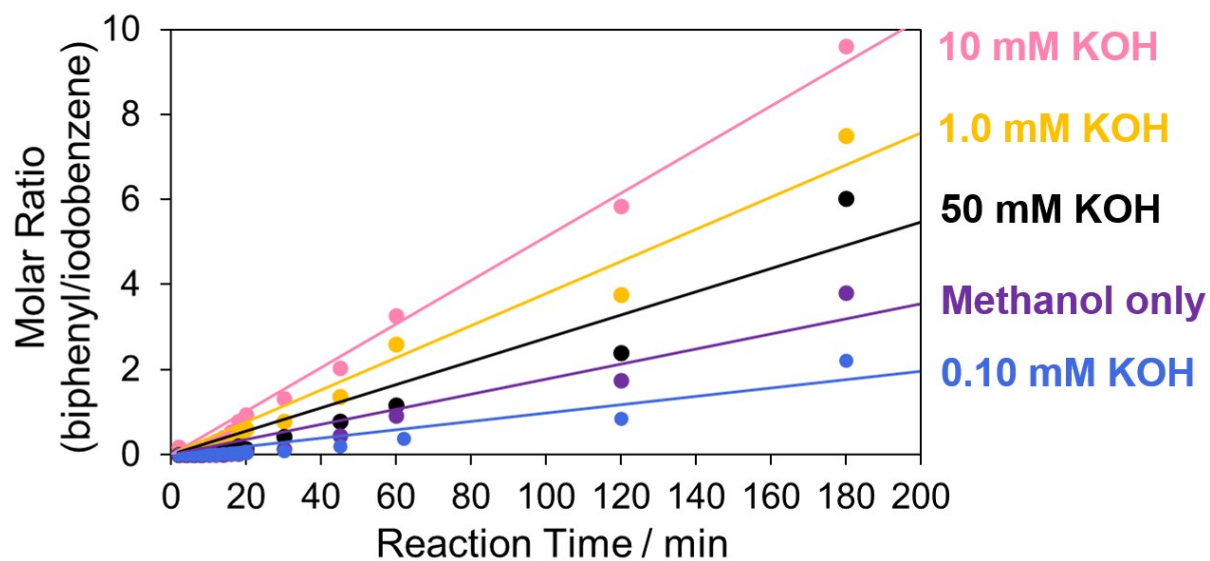


Fig. S7 Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction of iodobenzene with 4-methylphenylboronic acid in the cases using Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol in the absence and presence of 0.10 mM, 1.0 mM, 10 mM and 50 mM KOH.

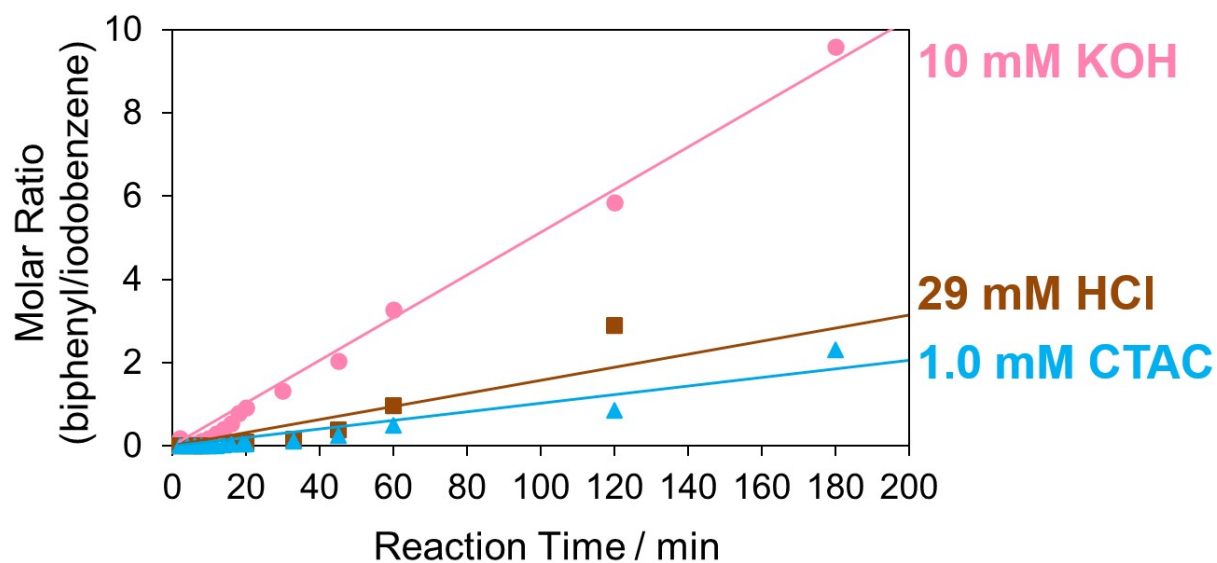


Fig. S8 Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction of iodobenzene with 4-methylphenylboronic acid in the cases using Pd structures prepared from the TOPO paste of Pd NPs by dipping into methanol in the presence of 10 mM KOH, 29 mM HCl and 1.0 mM CTAC.

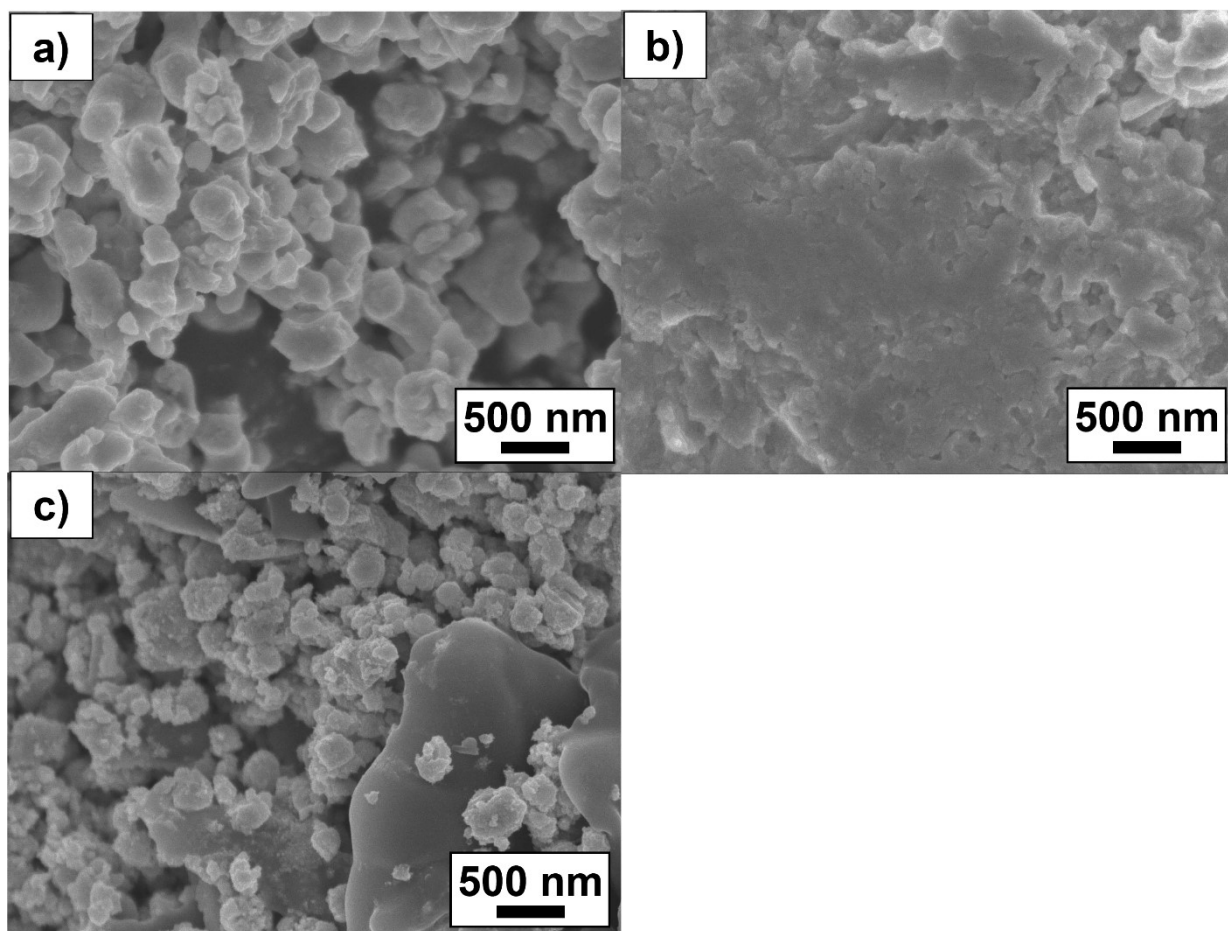


Fig. S9 SEM images of Pd structures prepared from the TOPO paste of Pd NPs by dipping into the 10 mM KOH methanol solution before and after the use for Suzuki coupling reaction in methanol. The use numbers of catalysts were (a) zero (Fresh), (b) one (Reuse 1) and (c) two (Reuse 2).

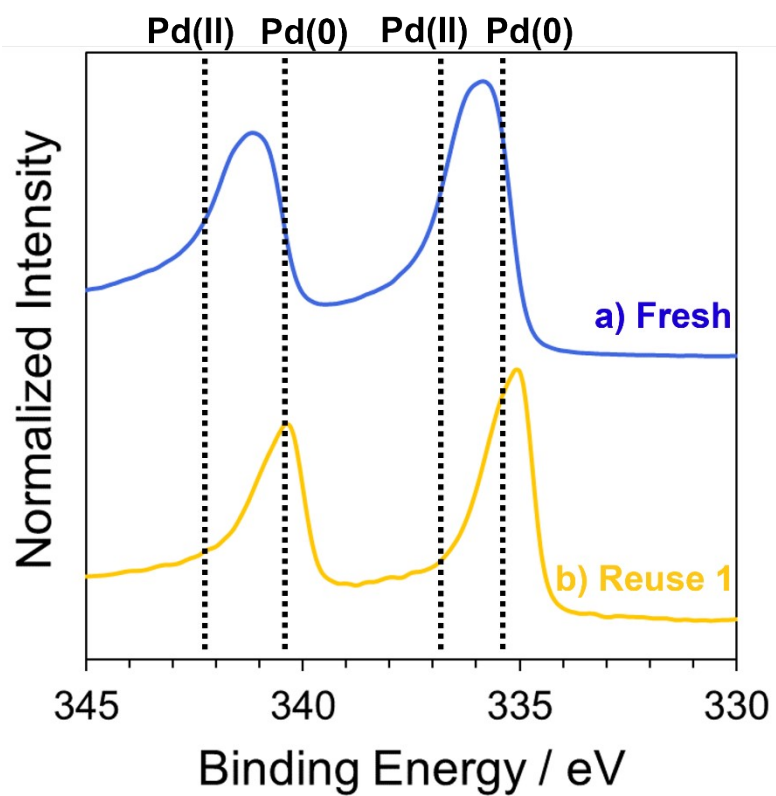


Fig. S10 High resolution XPS spectra of Pd structures prepared a) before (Fresh) and b) after the use for Suzuki coupling reaction in methanol (Reuse1).

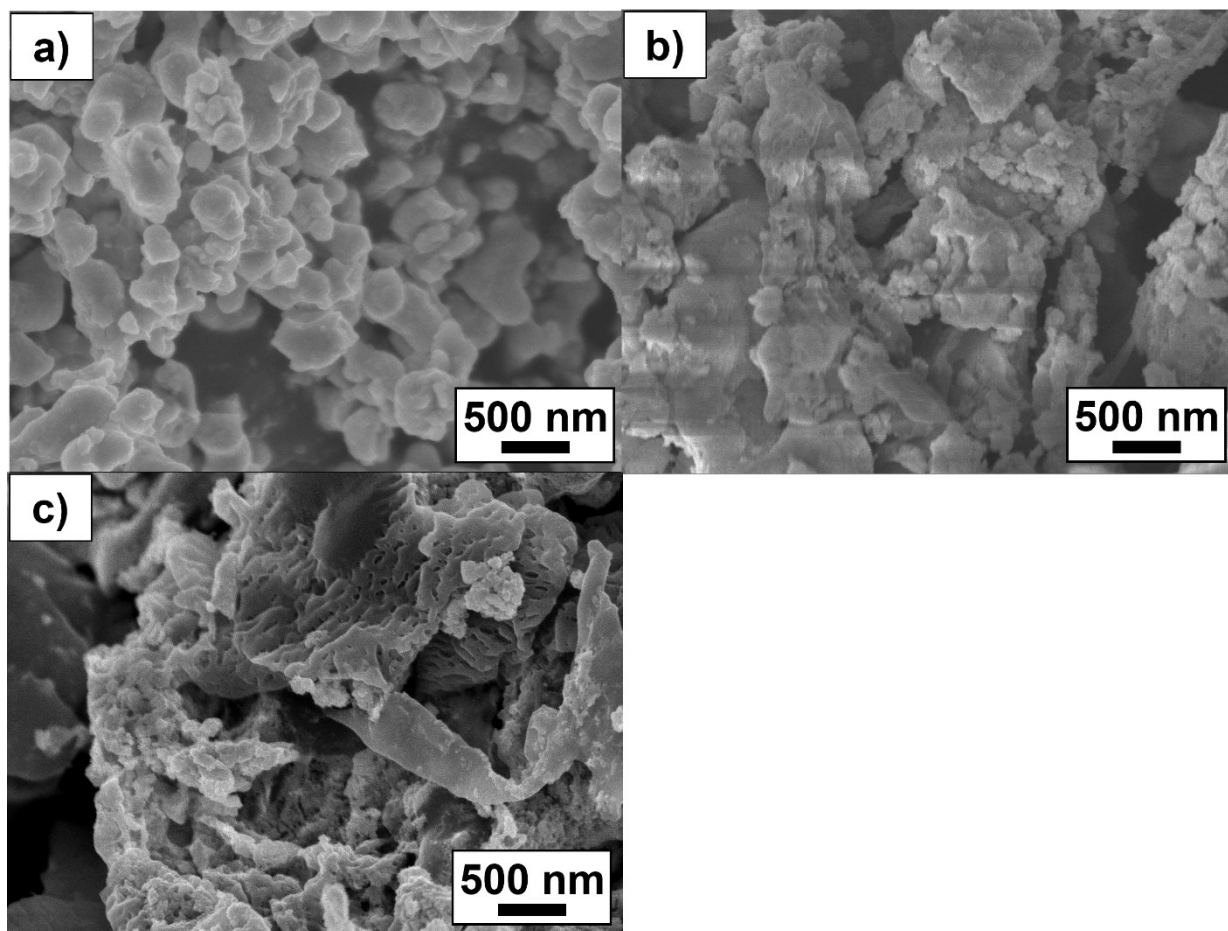


Fig. S11 SEM images of Pd structures prepared from the TOPO paste of Pd NPs by dipping into the 10 mM KOH methanol solution before and after the use for Suzuki coupling reaction in water. The use numbers of catalysts were (a) zero (Fresh), (b) one (Reuse 1) and (c) two (Reuse 2).

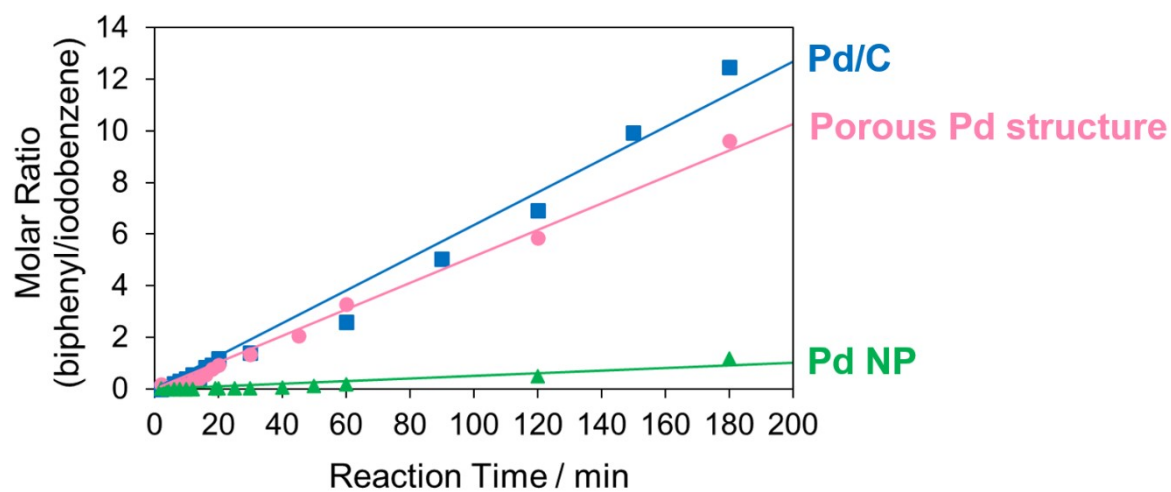


Fig. S12 Fitting lines of molar ratio (4-methylbiphenyl/iodobenzene) to reaction time (≤ 3 h) in the Suzuki coupling reaction of iodobenzene with 4-methylphenylboronic acid in the cases using porous Pd structure, Pd/C and oleylamine-capped Pd NP.