Supporting Information for

Epitaxial Growth of Pd Nanoparticles on Molybdenum Disulfide by Sonochemistry and Its Effects on Electrocatalysis

Eunjik Lee\textsuperscript{a} and Young-Uk Kwon\textsuperscript{a,b,*}

\textsuperscript{a}SKKU Advanced Institute of Nanotechnology, Sungkyunkwan University, Suwon, 440-746, Republic of Korea

\textsuperscript{b}Department of Chemistry, Sungkyunkwan University, Suwon, 440-746, Republic of Korea

\textsuperscript{*}Corresponding author. Tel.: +82 31 290 7070; fax: +82 31 290 7075
E-mail address: ywkwon@skku.edu

\textsuperscript{ESI} for \textit{RSC Advances}. This journal is © The Royal Society of Chemistry 2016
Figure S1. XRD of MoS$_2$ before and after ultrasound treatment. The patterns of MoS$_2$ in the literature in the 2H and 3R polytypes are also shown as references.

Figure S2. TEM images of MoS$_2$ before (a) and after (b) sonication for 3 h in EG.
Figure S3. (a) Pd (200) peak ($2\theta = 42$ - $48^\circ$) regions of XRD patterns of Pd/MoS$_2$ samples and Pd black. (b) Magnified view of Pd(14.4)/MoS$_2$ sample. Vertical dotted line indicates the position of Pd (200) peak of Pd black.

All of the Pd/MoS$_2$ samples show the Pd (200) peaks at lower $2\theta$ than Pd black indicating the lattice expansion. Pd(14.4)/MoS$_2$ sample has the lowest $2\theta$ and it is gradually shifted to higher angles as the Pd content increases indicating that the Pd lattice shrinkage. This trend is also observed in the positions of the Pd (111) peaks (extracted by the deconvolution described in the main text, Figure 1(b)).

Figure S4. (a) HRTEM and (b) FFT images of Pd(14.4)/MoS$_2$ of the 64 grids shown in (a).
**Figure S5.** (a) HRTEM and (b) FFT images of Pd(25.6)/MoS$_2$ of the 64 grids shown in (a).

**Figure S6.** (a) HRTEM and (b) FFT images of Pd(33.6)/MoS$_2$ of the 64 grids shown in (a).