Supporting Information

Small size Mo$_2$C nanocrystals coupled with reduced graphene oxide enhance the electrochemical activity of palladium nanoparticles towards methanol oxidation reaction

Chunyong He$^{a,b}$, Juzhou Tao$^{a,b}$, Guoqiang He$^c$ Pei Kang Shen$^{*,c}$ Yongfu Qiu$^d$

$^a$ Institute of High Energy Physics, Chinese Academy of Sciences (CAS), Beijing 100049, China
$^b$ Dongguan Neutron Science Center, Dongguan 523803, China
$^c$ Collaborative Innovation Center of Sustainable Energy Materials, Guangxi University, Nanning, Guangxi, 530004, PR China
$^d$ College of Chemistry and Environmental Engineering, Dongguan University of Technology, Guangdong 523808, P. R. China

E-mail: taoj@ihep.ac.cn; hechunyong@ihep.ac.cn; pkshen@gxu.edu.cn

Keywords: Small size, Mo$_2$C nanocrystals, Electrocatalyst, Methanol Oxidation Reaction, Direct Methanol Fuel Cells
**Figure S1** The XRD pattern of Mo$_2$C-RGO, Pd/C and Pd/Mo$_2$C-RGO.

**Figure S2** Size-distribution histograms of the Mo$_2$C-RGO nanosheets.
Figure S3 The comparison of specific activities ($j_k$) of Pd/C and Pd/Mo$_2$C-RGO. The Pd/Mo$_2$C-RGO (1.59 mA cm$^2$) exhibits about twice enhancement in specific activity compared to the Pd/C (0.78 mA cm$^2$), and 1.6 time of Pd/G (0.98 mA cm$^2$) at -0.2 V (vs. Hg/HgO).
**Fig. S4** CO-stripping of Pd/C (a), Pd/RGO (b) and Pd/Mo$_2$C-RGO (c) in 1.0 mol L$^{-1}$ KOH solution.

**Fig. S5** (a,b) TEM images of Pd/Mo$_2$C-RGO after ADT test (2000 cycles), (c) HRTEM image of Pd/Mo$_2$C-RGO after stability test.