Supplementary Information

Hybridization of Clay Minerals with the Floating Film of a Cationic Ir(III) Complex at an Air-water Interface

Hisako Sato,*[a] Kenji Tamura[b], Keishi Ohara [a], Shin-ichi Nagaoka [a], and Akihiko Yamagishi[c]

[a]Department of Chemistry, Graduate School of Science and Engineering,

Ehime University, Matsuyama 790-8577, Japan

[b]National Institute of Material Science, Tsukuba 305-0044,

[c]Department of Chemistry, Faculty of Science, Toho University, Chiba 274-8510, Japan

hsato@chem.sci.ehime-u.ac.jp

1. The ^{1}H NMR spectrum of $[Ir(ppy)_2(dc18bpy)]ClO_4$ in $CDCl_3$.

$[Ir(ppy)_2(dc18bpy)]ClO_4$: ^{1}H NMR (chloroform-d, 400MHz): δ 8.55(S, 2H), 7.83 (d, J=8.04Hz, 2H), 7.67(m, 4H), 7.61(d, J=7.04 Hz, 2H), 7.48 (d, J = 5.80 Hz, 2H), 7.10 (d, J = 4.24 Hz,2H), 6.97 (m, 4H), 6.82 (d, J = 7.32 Hz,2H), 6.22 (d, J = 6.88 Hz,2H), 2.82 (t, J = 7.68 Hz,4H), 1.18 (m, 64H), 0.81 (t, J = 6.84Hz,6H)

$[Ir(ppy)_2dc18bpy]ClO_4$:

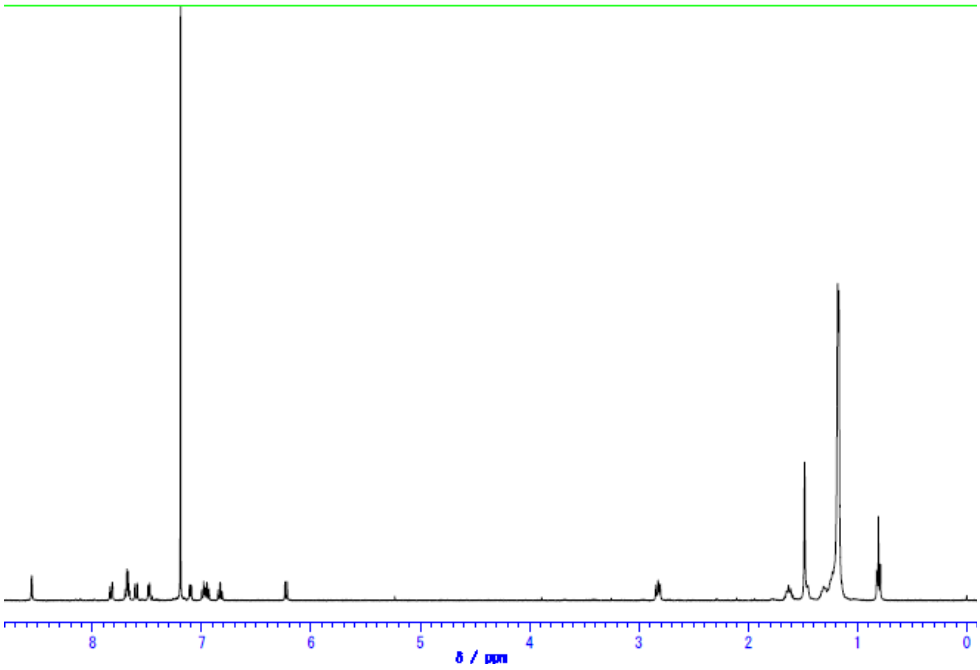

Figure S1. ^{1}H NMR of $[Ir(ppy)_2dc18bpy]ClO_4$

2. Mass spectroscopy data of $[Ir(ppy)_2(dc18bpy)]ClO_4$.

$[Ir(ppy)_2(dc18bpy)]ClO_4$: MS (m/z; ESI): 1161.7 (calculated for $[Ir(ppy)_2(dc18bpy)]^+$), 1161.2 (M^+) (experimentally obtained). The isotope distribution is shown below:

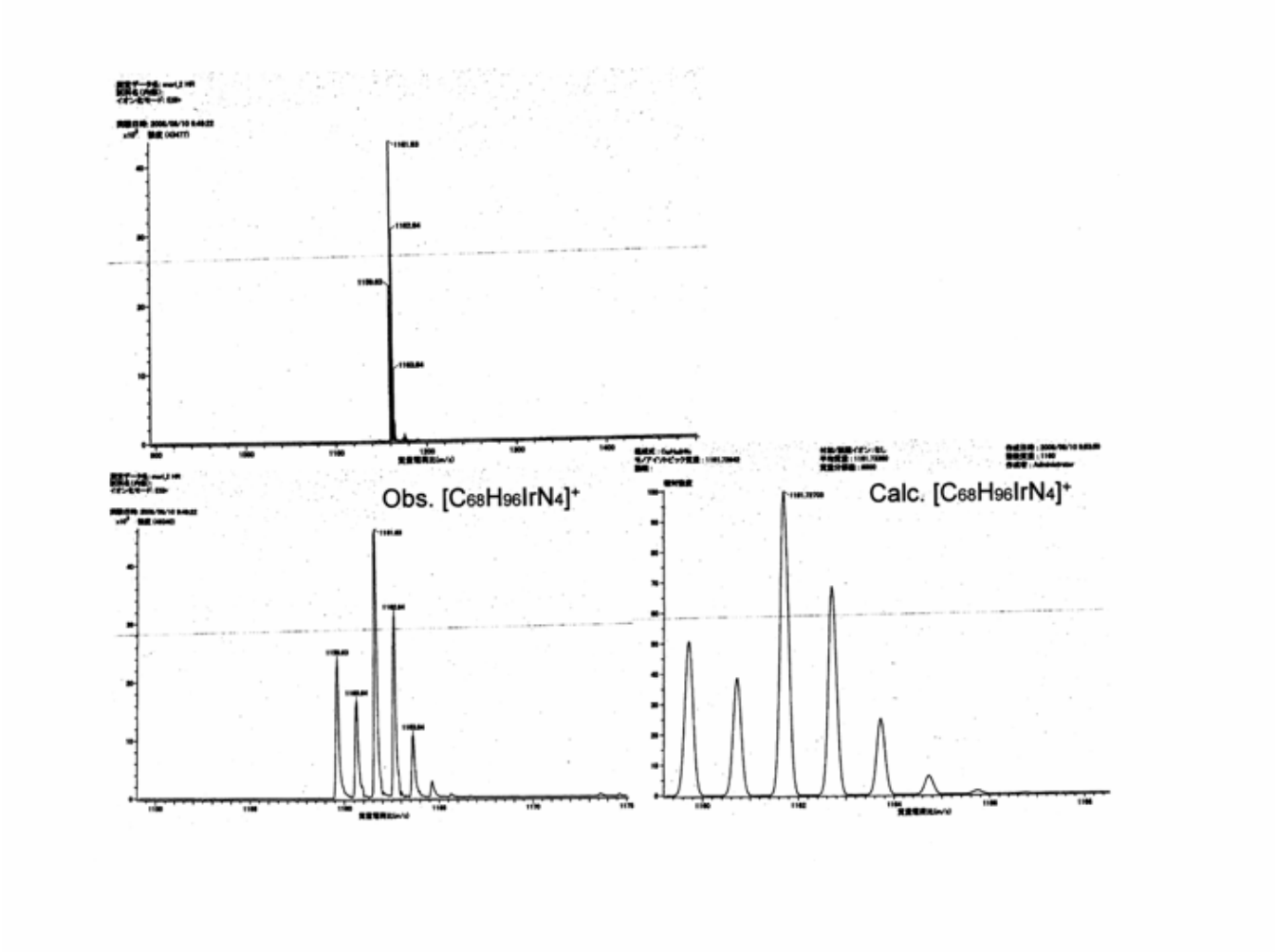

Figure S2. The results of mass spectroscopy of $[Ir(ppy)_2(dc18bpy)]ClO_4$

3. The electronic spectrum of $[Ir(ppy)_2(dc18bpy)]ClO_4$ in methanol.

The electronic spectrum of a methanol solution of $[Ir(ppy)_2(dc18bpy)]ClO_4$ is shown below:

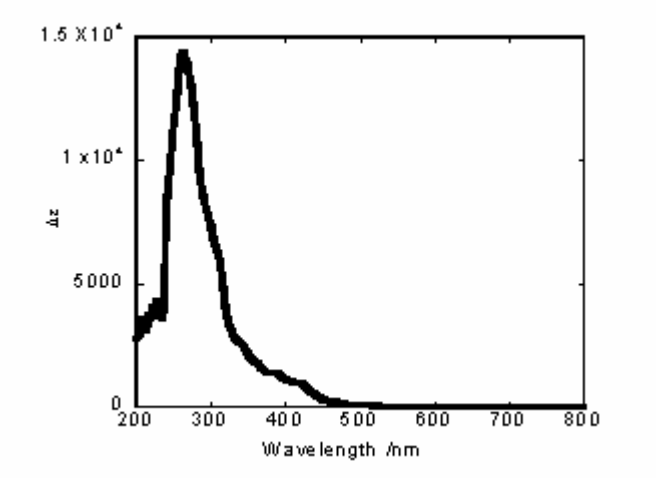

Figure S3. The UV-visible spectrum of $[Ir(ppy)_2(dc18bpy)]ClO_4$ in methanol.

4. The π–Ạcurves when a suphase contained various amounts of synthetic saponite.

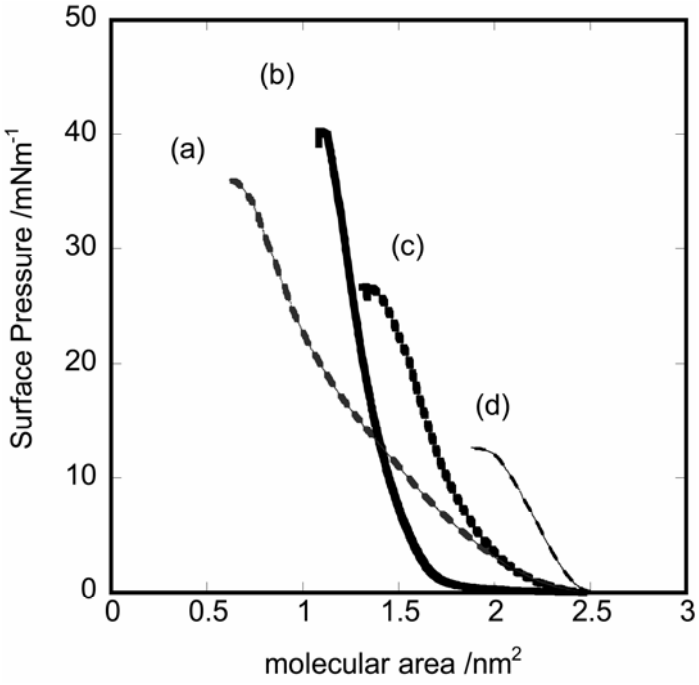

Figure S4. The π-A curves when a subphase was (a) pure water, (b) an aqueous suspension of 10 mgL^{-1} saponite, (c) an aqueous suspension of 20 mgL^{-1} saponite, and (d) an aqueous suspension of 50 mgL^{-1} saponite.

5. The deposition curve of the floating film of Ir –Sap onto a hydrophilic glass plate.

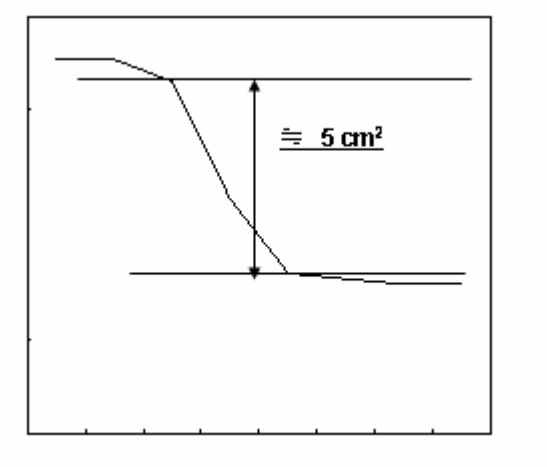

Figure S 5. An example of the deposition curve of the hybrid film of ***Ir-Sap*** onto a hydrophilic glass substrate. The decrease of the area was ca. 5 cm^2 in the upward direction and the total area of both sides of the glass plate was ca. 5.0 cm^{-2}, leading to the transfer ratio of 0.9 ± 0.1.

6. The emission spectra for the hybrid films when an oxygen gas was introduced.

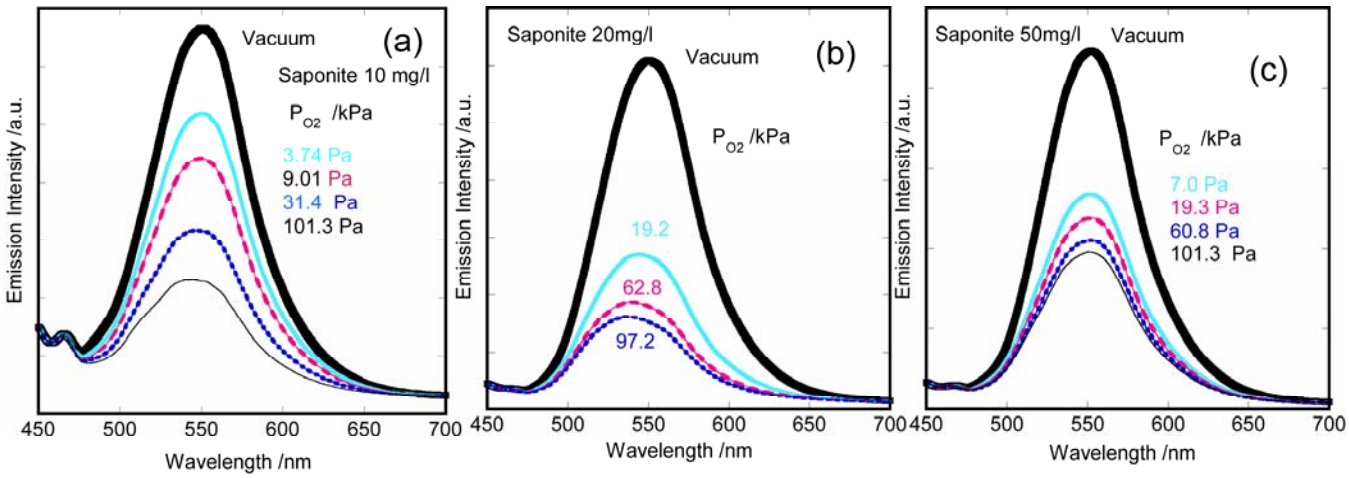

Figure S6. The luminescence spectra from the single layered hybrid LB films of ***Ir-Sap*** prepared from a subphase of (a) 10 mgL^{-1} (b) 20 mgL^{-1} and (c) 50 mgL^{-1} of a clay when an oxygen gas was introduced at various pressures**.** The excitation wavelength was 430 nm. The horizontal axis denotes the intensity of luminescence at an arbitrary unit.

7. **Quenching effects by oxygen molecules.**

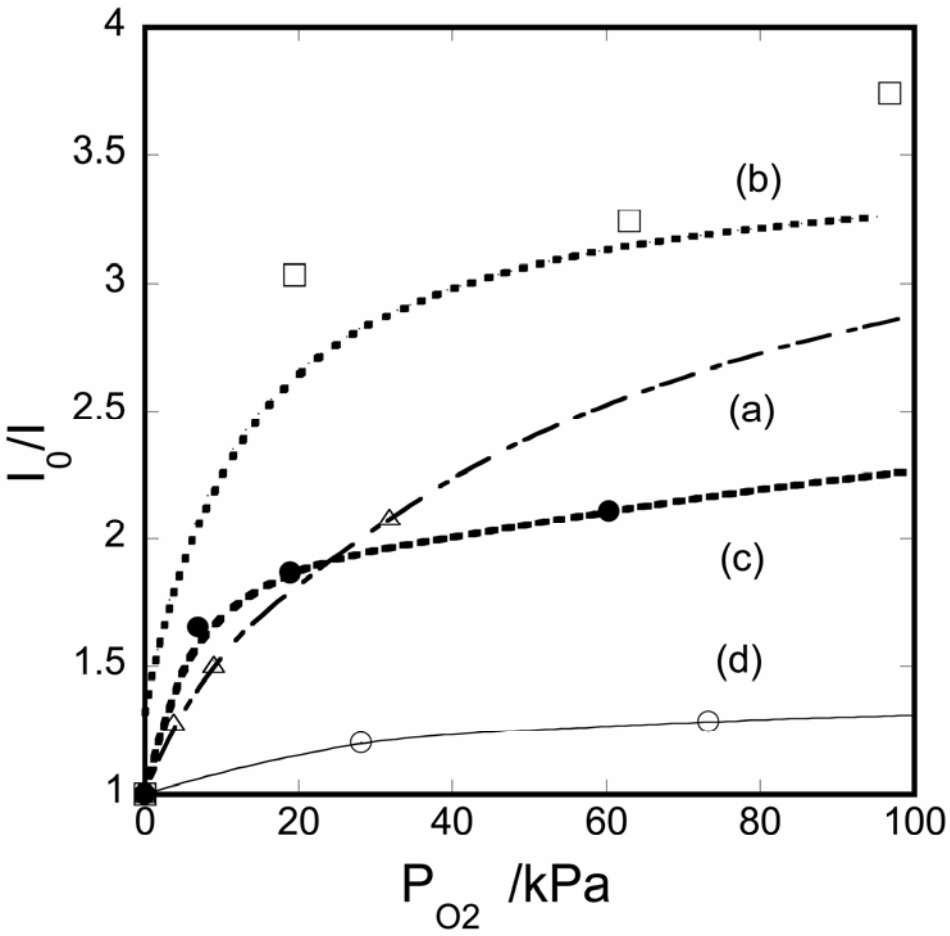

Figure S7. Dependence of the change of emission intensity on the vapor pressure of oxygen gas for ***Ir-Sap*** films (a – c). The plot for ***Ir-H2O*** was also included (d). The excitation and emission wavelengths were 430 nm and 550 nm, respectively. The films were prepared for an aqueous dispersion containing (a) 10 mg L^{-1}, (b) 20 mg L^{-1} and (c) 50 mg L^{-1} of saponite, respectively. Curves were fit by the two-site model according to eq. (2) in the text.

8. The decay of the emission from the hybrid films in vacuum or under the atmosphere of an oxygen gas.

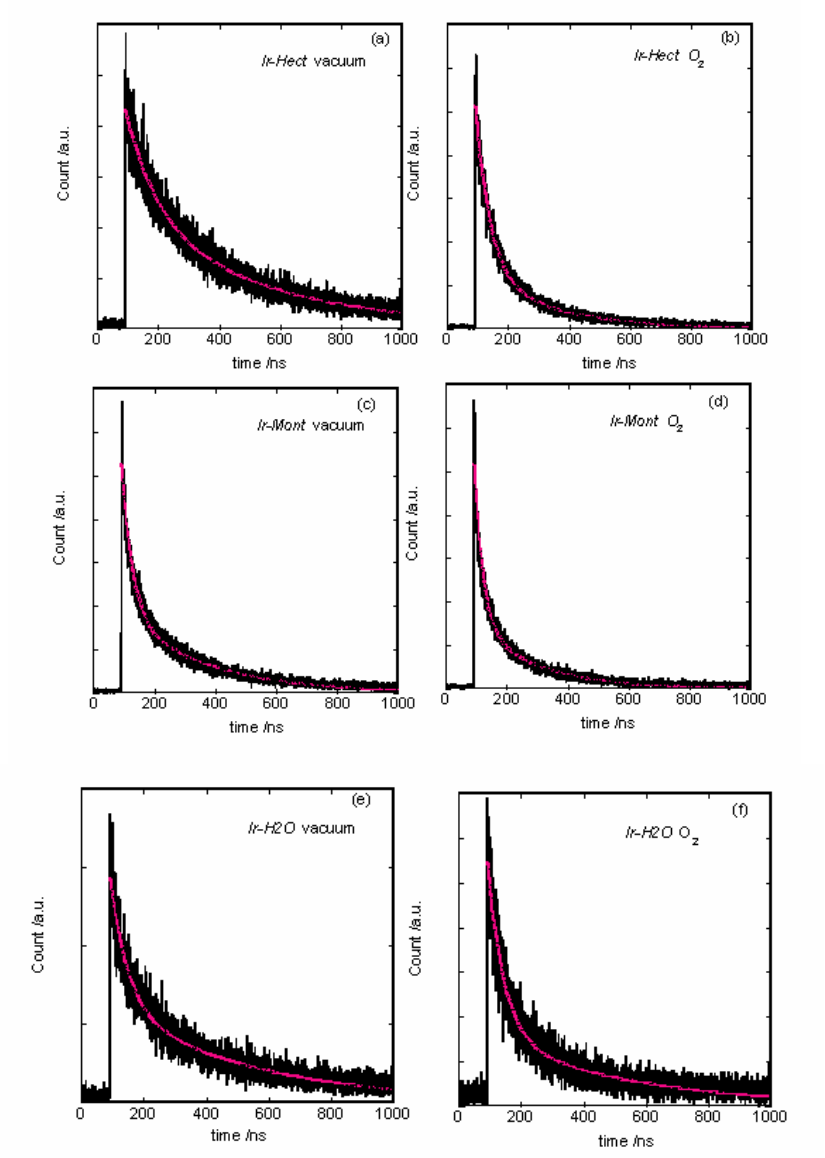

Figure S8. The decay curves of the emission from the hybrid films under vacuum and O_2 condition: (a) ***Ir-Hect*** in vacuum, (b) ***Ir-Hect*** in O_2, (c) ***Ir-Mont*** in vacuum, (d) ***Ir-Mont*** in O_2, (e) ***Ir-H$_2$O*** in vacuum and (f) ***Ir-H$_2$O*** in O_2.