

Supplementary Information for

Oligonucleotide assisted light-emitting Alq3 microrods: Energy transfer effect with fluorescent dyes

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In this Supplementary Information, the following results are presented:

- (1) High-resolution transmission electron microscope (HR-TEM) images and energy dispersive X-ray spectroscopy (EDS) analysis of oligonucleotide assisted Alq3 microrods.
- (2) Fourier transform infrared (FTIR) spectra of Alq3 particles and oligonucleotide assisted Alq3 microrods.
- (3) Scanning electron microscope (SEM) image and X-ray diffraction (XRD) patterns of cetyltrimethylammonium bromide (CTAB) assisted Alq3 microrods.
- (4) PL spectra of the Alq3 microrods with Cy3-oligonucleotide excited with 540 nm (green line) and with Cy5-oligonucleotide excited with 640 nm (red line).

Fig. S1 (a) and (b) show the HR-TEM image and the cross section scanning transmission electron microscope (STEM) image of the oligonucleotide assisted Alq3 microrods, respectively. We observed the hexagonal prismatic shape of the oligonucleotide assisted Alq3 microrods. Fig. S1 (c) shows the EDS pattern for oligonucleotide assisted Alq3 microrods. The constituent element induced from phosphate (P) of oligonucleotide was found from the EDS pattern, indicating that the oligonucleotide was hybridized with Alq3 microrods.

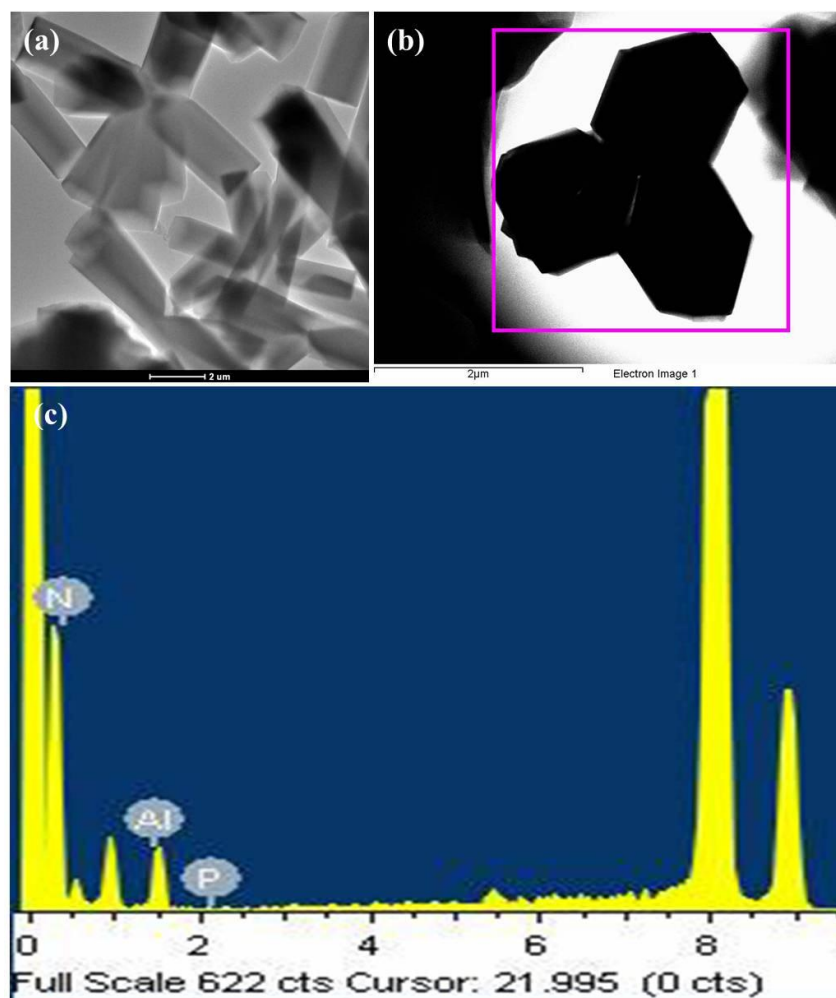


Figure. S1. (a) HR-TEM image of oligonucleotide assisted Alq3 microrods. (b) Cross section view of STEM image of oligonucleotide assisted Alq3 microrods. (c) EDS pattern of oligonucleotide assisted Alq3 microrods.

Fig. S2 shows the FTIR spectra of Alq3 particles and oligonucleotide assisted Alq3 microrods in the range of 700 ~ 1600 cm^{-1} . The FTIR characteristic peaks of the Alq3 particles were C-C stretching vibration (1580, 1501, 1470, 1384, and 748 cm^{-1}), C-N stretching vibration (1580, 1384, 1281, and 1229 cm^{-1}), C-C-H bending vibration (1501, 1425, 1331, 1281, and 1116 cm^{-1}), C-O stretching vibration (1470, 1331, and 1281 cm^{-1}), N-C-H bending vibration (1384 and 1229 cm^{-1}), C-N-C bending vibration (1116 cm^{-1}), C-C-C bending vibration (806 and 748 cm^{-1}), C pyramidalization mode (825 and 789 cm^{-1}), N pyramidalization mode (789 cm^{-1}), C-C torsional mode (789 cm^{-1}) and Al-O stretching vibration (748 cm^{-1}).^{1,2} From the FTIR spectra of oligonucleotide assisted Alq3 microrods, we observed the characteristic peaks induced from oligonucleotide, such as C-C stretching vibration (978 cm^{-1}), C-O stretching vibration (1010 cm^{-1}), PO_2^- symmetric stretching vibration (1087 cm^{-1}), PO_2^- asymmetric stretching vibration (1201 cm^{-1}) and C-N stretching vibration (1303 cm^{-1}).^{3,4} Therefore, we confirm that the oligonucleotide was hybridized with Alq3 microrods.

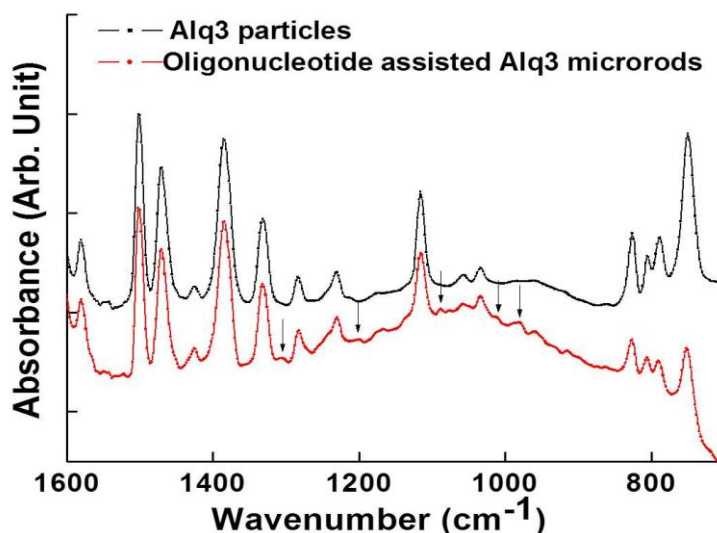


Figure S2. FTIR spectra of Alq3 particles (black line) and oligonucleotide assisted Alq3 microrods (red line).

Fig. S3 (a) shows the SEM image and (b) XRD patterns of the Alq3 microrods which were prepared with a micro-emulsion method with the assistance of CTAB. Although they also show hexagonal prismatic shape, XRD patterns show three major crystalline peaks at 6.42° , 11.43° , and 17.72° which correspond to (001), (011) and (021) lattice planes, respectively.

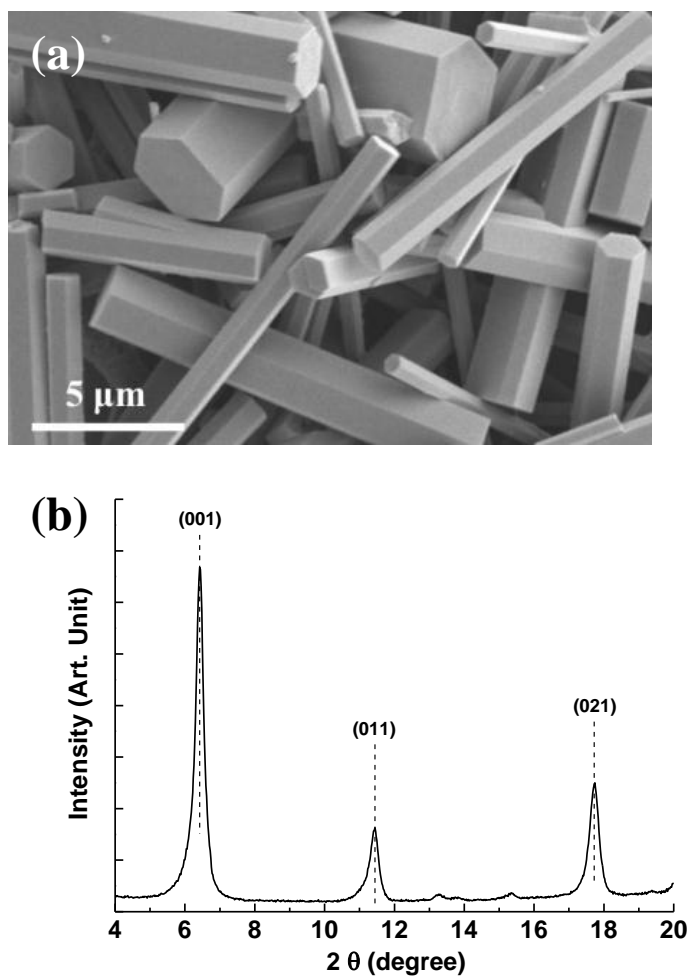


Figure S3. (a) SEM image and (b) XRD patterns of CTAB assisted Alq3 microrods.

Fig. S4 shows the PL spectra of the Alq3 microrods with Cy3-oligonucleotide (excited with 540 nm), with Cy5-oligonucleotide (excited with 640 nm), respectively. In case of microrods with Cy5-oligonucleotide, we only observed the PL peak of Cy5 (672 nm) without Alq3 related peak, as compared to those with Cy3-oligonucleotide.

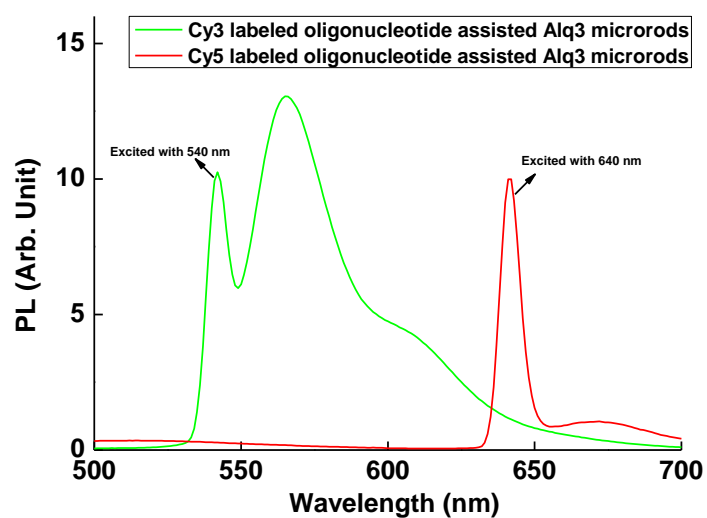


Figure S4. PL spectra of the Alq3 microrods with Cy3-oligonucleotide excited with 540 nm (green line) and with Cy5-oligonucleotide excited with 640 nm (red line).

References

- (1) M. Cölle, S. Forero-Lenger, J. Gmeiner and W. Brüttingy, *Phy. Chem. Chem. Phys.*, 2003, **5**, 2958.
- (2) T. Gavrilko, R. Fedorovich, G. Dovbeshko, A. Marchenko, A. Naumovets, V. Nechytaylo, G. Puchkovska, L. Viduta, J. Baran and H. Ratajczak, *J. Mol. Struct.*, 2004, **704**, 163.
- (3) C. D. Kanakis, P. A. Tarantilis, C. Pappas, J. Bariyanga, H. A. Tajmir-Riahi and M. G. Polissiou, *J. Photochem. Photobio. B*, 2009, **95**, 204.
- (4) D. H. Park, N. Kim, C. Cui, Y. K. Hong, M. S. Kim, D. -H. Yang, D. -C. Kim, H. Lee, J. Kim, D. J. Ahn and J. Joo, *Chem. Commun.*, 2011, **47**, 7944.