

# Supplementary Information for

## Crystal plane engineering of MAPbI<sub>3</sub> in epoxy-based materials for superior gamma-ray shielding performance

Kai Cui<sup>1</sup>, Yang Li<sup>1\*</sup>, Wenjing Wei<sup>1</sup>, Qianqian Teng<sup>1</sup>, Tianyu Zhang<sup>1</sup>, Jinzhu Wu<sup>1</sup>, Hongjun Kang<sup>1</sup>, Wei Qin<sup>2\*</sup>, Xiaohong Wu<sup>1\*</sup>

<sup>1</sup> *School of Chemistry and Chemical Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, China*

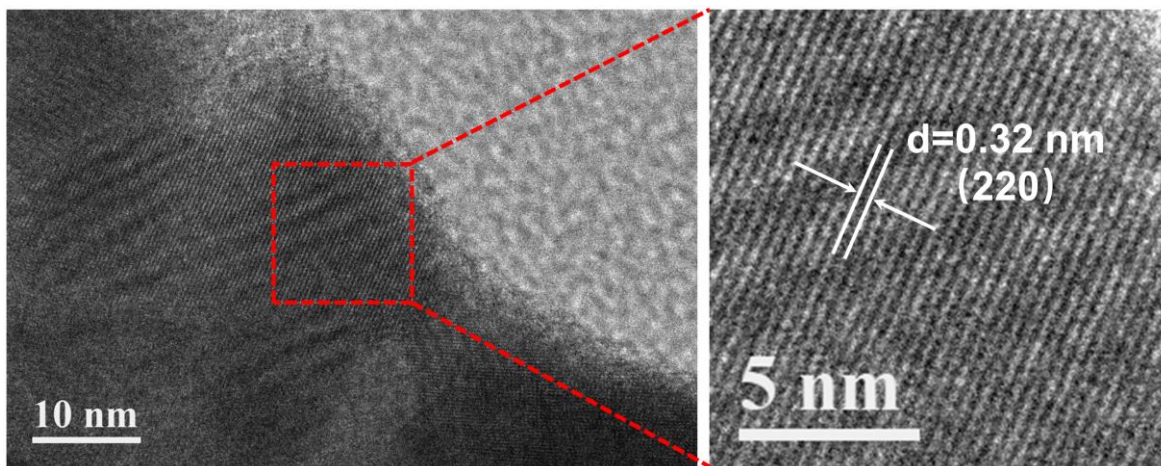
<sup>2</sup> *School of Materials Science and Engineering, Harbin Institute of Technology, Harbin, Heilongjiang 150001, China*

\* *E-mail addresses: liyang198517@hit.edu.cn*

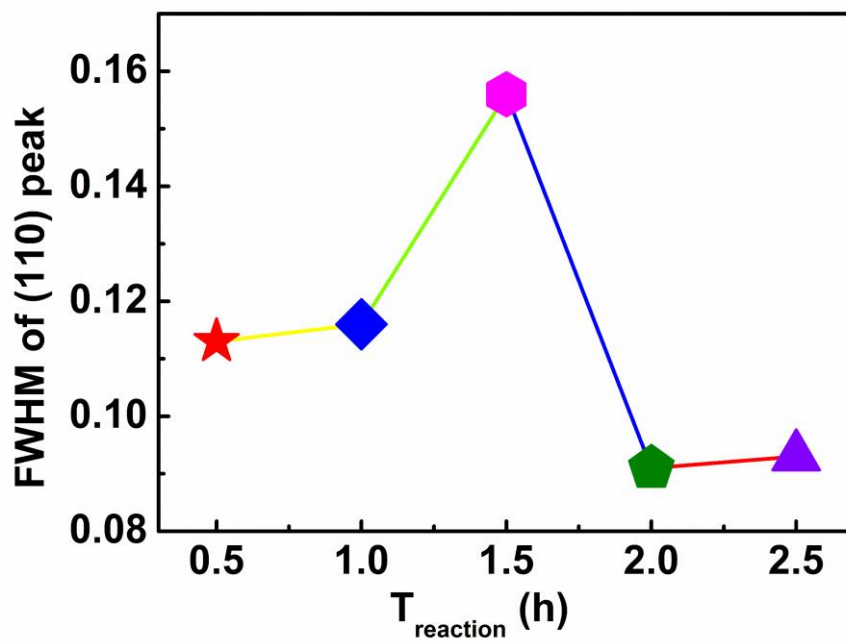
qinwei@hit.edu.cn

wuxiaohong@hit.edu.cn

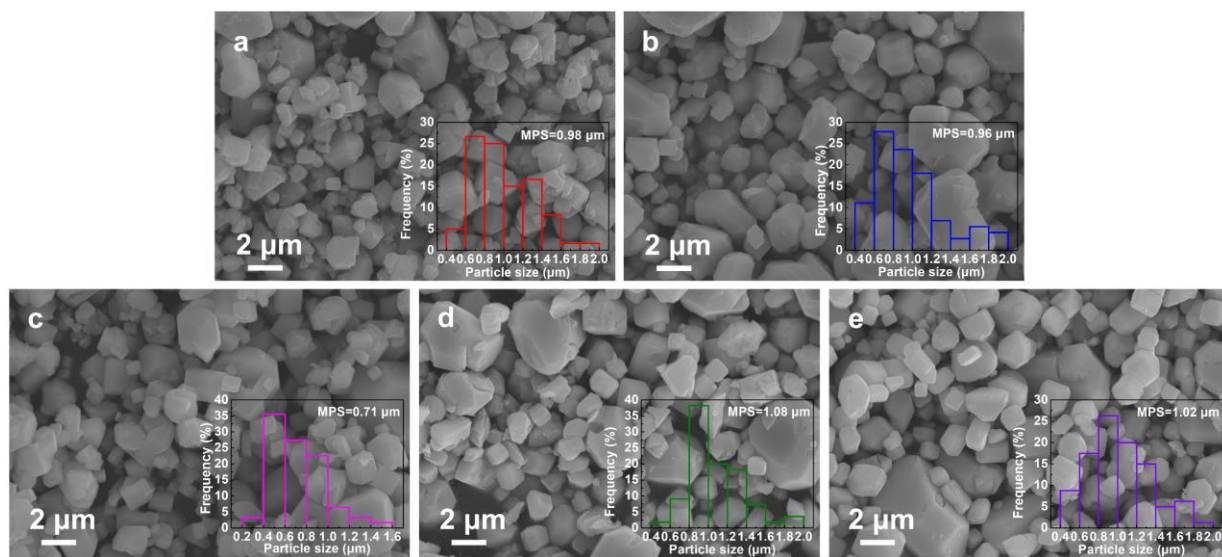
## Figures



**Fig. S1.** HRTEM image of MAPbI<sub>3</sub> microcubic crystals.



**Fig. S2.** FWHM of (110) crystal plane for MAPbI<sub>3</sub> microcubic crystals.



**Fig. S3.** SEM image of MAPbI<sub>3</sub> microcubic crystals. Inset: statistical histogram of the particle sizes for the corresponding samples. (a) 0.5 h; (b) 1.0 h; (c) 1.5 h; (d) 2.0 h; (e) 2.5 h.

## Tables

**Table S1.** The transmission ( $I/I_0$ ) against thickness for all samples at Am-241 (59.5 keV)

| (110)/(220) crystal plane content | Thickness/cm | $I/I_0$ |
|-----------------------------------|--------------|---------|
| 1.14                              | 0.128        | 0.794   |
|                                   | 0.254        | 0.655   |
|                                   | 0.382        | 0.541   |
| 1.15                              | 0.130        | 0.785   |
|                                   | 0.256        | 0.637   |
|                                   | 0.401        | 0.509   |
| 1.42                              | 0.112        | 0.809   |
|                                   | 0.225        | 0.673   |
|                                   | 0.337        | 0.560   |
| 1.72                              | 0.121        | 0.796   |
|                                   | 0.259        | 0.631   |
|                                   | 0.396        | 0.501   |
| 2.13                              | 0.139        | 0.752   |
|                                   | 0.265        | 0.605   |
|                                   | 0.388        | 0.486   |

**Table S2.** The gamma ray shielding performance of composites at Cs-137 (661 keV)

| (110)/(220) crystal plane content | $\mu$<br>$\text{cm}^{-1}$ | $\mu_m$<br>$\text{cm}^2 \text{g}^{-1}$ | HVL<br>cm | TVL<br>cm | MFP<br>cm |
|-----------------------------------|---------------------------|--|-----------|-----------|-----------|
| 1.14                              | 0.0942                    | 0.0675                                 | 7.3583    | 24.4436   | 10.6157   |
| 1.15                              | 0.0948                    | 0.0679                                 | 7.3117    | 24.2889   | 10.5485   |
| 1.42                              | 0.0953                    | 0.0683                                 | 7.2733    | 24.1614   | 10.4932   |
| 1.72                              | 0.0962                    | 0.0689                                 | 7.2053    | 23.9354   | 10.3950   |
| 2.13                              | 0.0970                    | 0.0695                                 | 7.1458    | 23.7380   | 10.3093   |

**Table S3.** The gamma ray shielding performance of composites at Co-60 (1250 keV)

| (110)/(220) crystal plane content | $\mu$<br>cm <sup>-1</sup> | $\mu_m$<br>cm <sup>2</sup> g <sup>-1</sup> | HVL<br>cm | TVL<br>cm | MFP<br>cm |
|-----------------------------------|---------------------------|--|-----------|-----------|-----------|
| 1.14                              | 0.0828                    | 0.0593                                     | 8.3713    | 27.8090   | 12.0773   |
| 1.15                              | 0.0831                    | 0.0595                                     | 8.3411    | 27.7086   | 12.0337   |
| 1.42                              | 0.0835                    | 0.0598                                     | 8.3012    | 27.5759   | 11.9760   |
| 1.72                              | 0.0837                    | 0.0600                                     | 8.2813    | 27.5100   | 11.9474   |
| 2.13                              | 0.0840                    | 0.0602                                     | 8.2518    | 27.4118   | 11.9048   |

**Table S4.** The densities of each MAPbI<sub>3</sub>/epoxy composites

| (110)/(220) crystal plane content | $\rho$ (g cm <sup>-3</sup> ) |
|-----------------------------------|------------------------------|
| 1.14                              | 1.398                        |
| 1.15                              | 1.392                        |
| 1.42                              | 1.399                        |
| 1.72                              | 1.394                        |
| 2.13                              | 1.396                        |