Supporting Information

Impressive radiation stability of organic solar cells based on fullerene derivatives and carbazole-containing conjugated polymers

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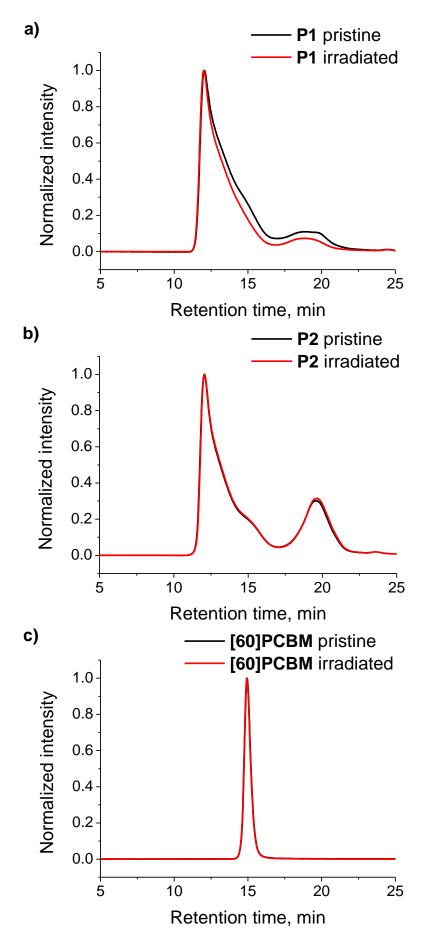


Figure S1. GPC profiles of the **P1** (a), **P2** (b) and [60]PCBM (c) before and after exposure to gamma rays with the absorbed radiation dose of 200 Gy.

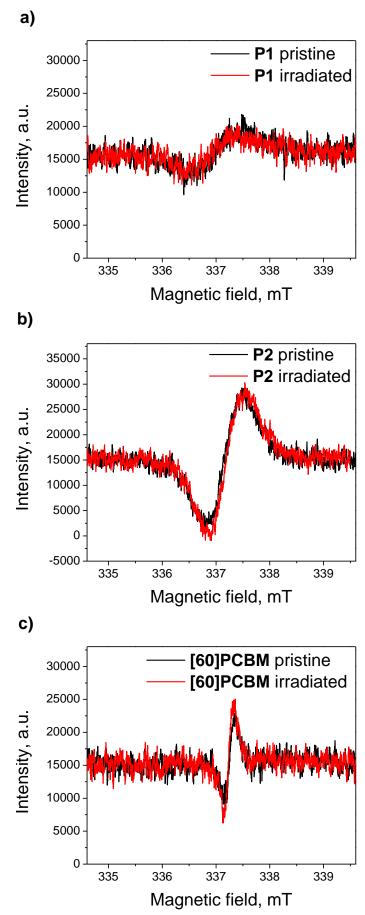


Figure S2. ESR spectra of the **P1** (a), **P2** (b) and [60]PCBM (c) before and after exposure to gamma rays with the absorbed radiation dose of 200 Gy.

Pristine films

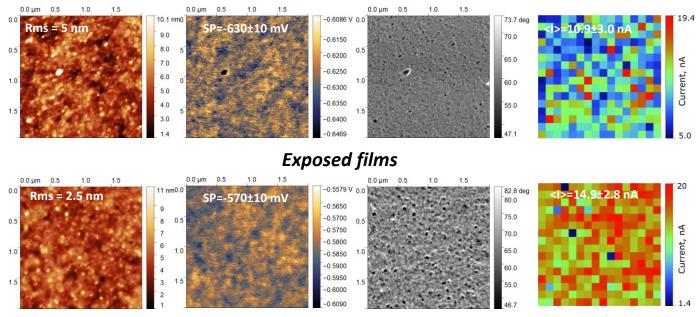


Figure S3. Left to right: AFM topography, surface potential, phase and current mapping images of **P1** films before (top) and after (bottom) exposure to gamma rays (6500 Gy).

Pristine films

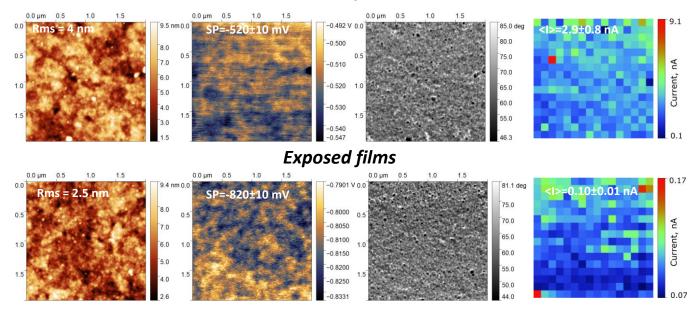


Figure S4. Left to right: AFM topography, surface potential, phase and current mapping images of **P2** films before (top) and after (bottom) exposure to gamma rays (500 Gy).

Pristine films

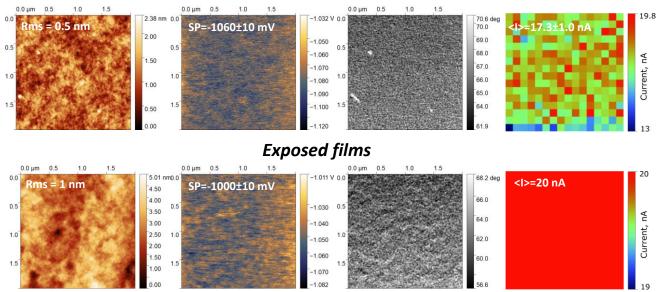


Figure S5. Left to right: AFM topography, surface potential, phase and current mapping images of [60]PCBM films before (top) and after (bottom) exposure to gamma rays (6500 Gy).

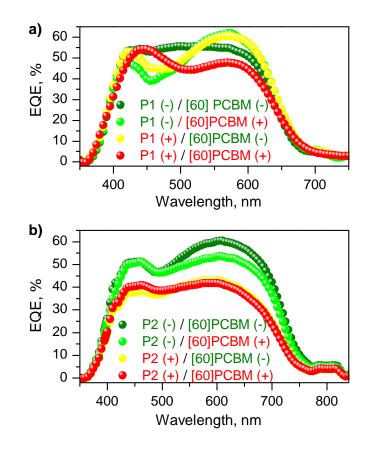


Figure S6. EQE spectra of organic solar cells based on the blends of non-exposed (-) and exposed to 200Gy (+) materials: P1/[60]PCBM (a) and P2/[60]PCBM (b).

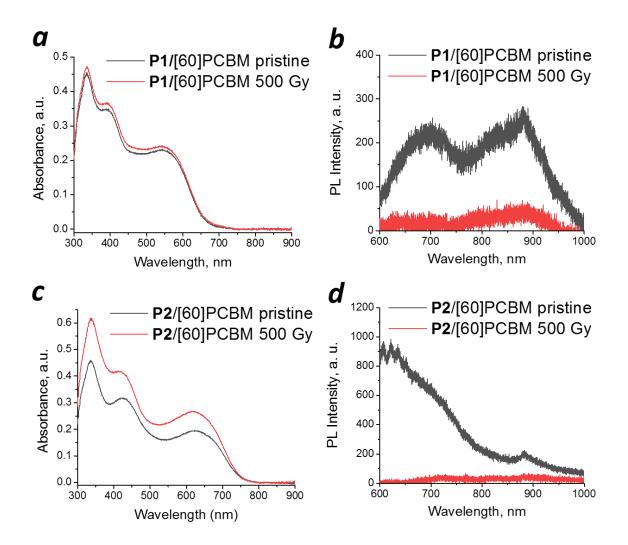


Figure S7 Evolution of the absorption (a, c) and PL (b, d) spectra of the P1/[60]PCBM (a-b) and P2/[60]PCBM (c-d) blend films

Pristine films

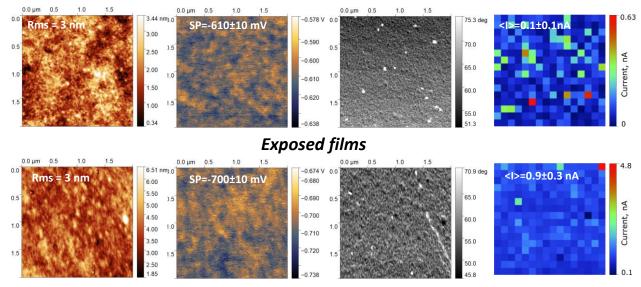


Figure S8. Left to right: AFM topography, surface potential, phase and current mapping images of **P1**/[60]PCBM films before (top) and after (bottom) exposure to gamma rays (6500 Gy)

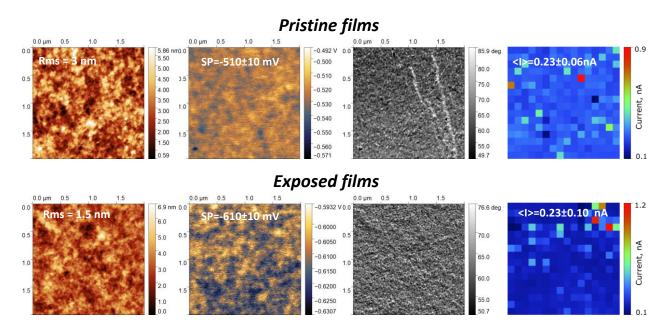


Figure S9. Left to right: AFM topography, surface potential, phase and current mapping images of **P2**/[60]PCBM films before (top) and after (bottom) exposure to gamma rays (500 Gy)

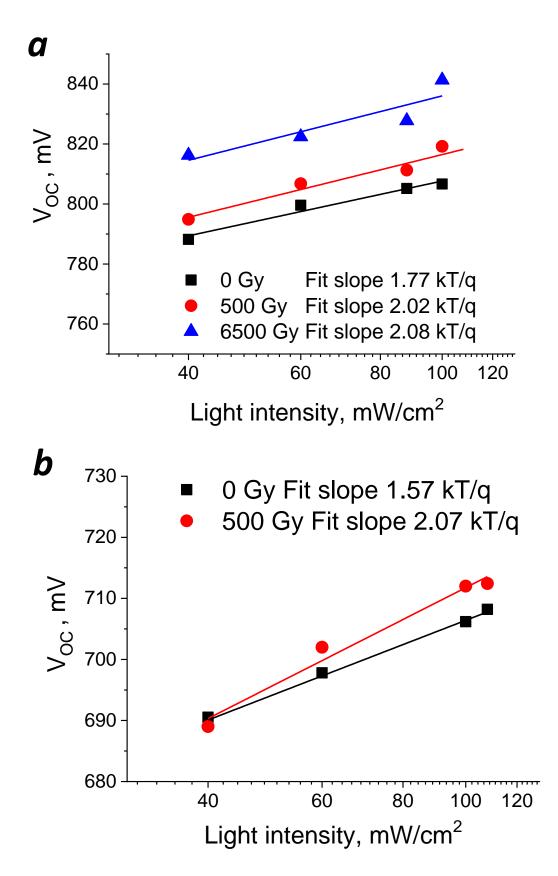


Figure S10. V_{OC} *vs.* light intensity dependences for organic solar cells based on the pristine and exposed to gamma rays **P1**/[60]PCBM (a) and **P2**/[60]PCBM (b) blend films

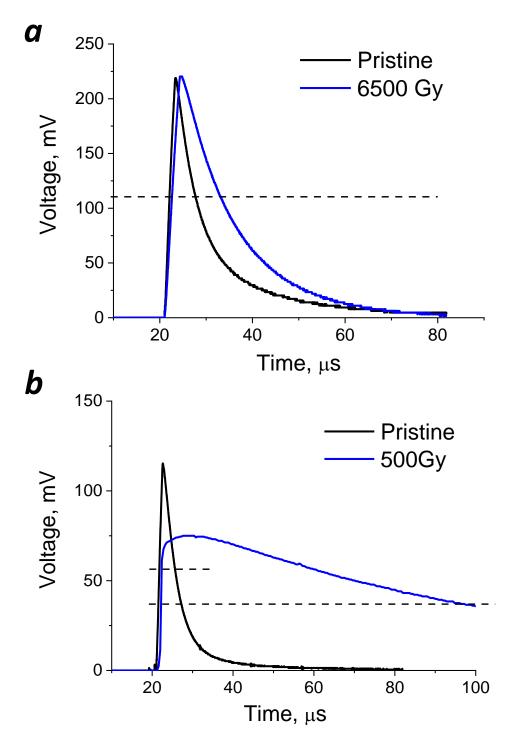


Figure S11. Transient photovoltage (TPV) profiles for organic solar cells based on the pristine and exposed to gamma rays P1/[60]PCBM (a) and P2/[60]PCBM (b) blend films

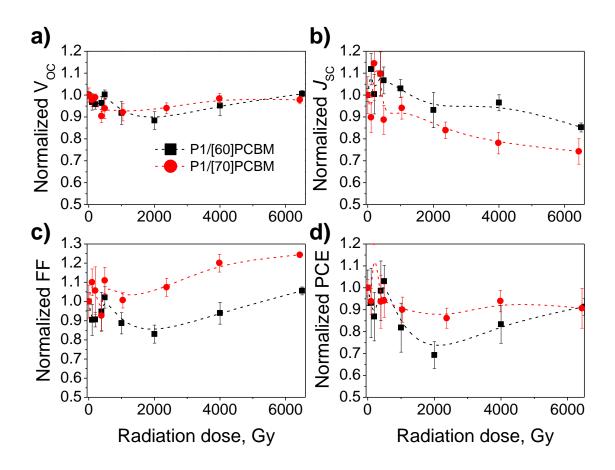


Figure S12. Normalized characteristics of the solar cells based on P1/[60]PCBM (black) and
P1/[70]PCBM (red) plotted as functions of the radiation dose: open circuit voltage V_{oc} (a), short circuit current density J_{sc} (b), fill factor FF (c) and power conversion efficiency PCE (d)

V _{oc} , m	v	J _{SC} , mA/cm ²		2 FF, %		PCE, %		
Gy P1/[60]PCBM*								
829 <u>+</u>	:27	9.7	±0.8	43	±4	3.4	±0.1	
811 <u>+</u>	:25	8.7	±0.7	47	±3	3.2	±0.2	
820 <u>+</u>	:13	11.1	±1.6	45	±5	4.1	±0.2	
750 <u>+</u>	:25	10.7	±1.0	39	±3	3.2	±0.4	
779 <u>+</u>	:39	8.6	±0.6	47	±3	3.2	±0.3	
765 <u>+</u>	:33	9.1	±0.5	43	±2	3.1	±0.2	
779 <u>+</u>	20	8.2	±0.4	46	±2	2.9	±0.2	
816 <u>+</u>	:19	7.6	±0.5	51	±2	3.2	±0.2	
		P1/[7	70]PCBM*	:				
838 <u>+</u>	:14	12.1	±0.4	50	±2	5.1	±0.4	
811 <u>+</u>	:30	13.5	±0.9	45	±4	4.8	±0.8	
803 <u>+</u>	:18	12.1	±1.1	45	±2	4.5	±0.6	
808 <u>+</u>	:25	13.2	±1.2	48	±5	5.1	±0.7	
841 <u>+</u>	:18	12.9	±0.7	51	±3	5.3	±0.4	
770 <u>+</u>	:44	12.4	±0.5	45	±3	4.2	±0.6	
741 <u>+</u>	:34	11.3	±1.0	42	±2	3.6	±0.3	
798 <u>+</u>	:38	11.7	±0.4	47	±3	4.3	±0.4	
		P2/[6	0]PCBM*	*				
702 <u>+</u>	14	12.6	±0.5	53	±4	4.6	±0.5	
690 <u>+</u>	:25	13.6	±0.9	48	±5	4.4	±0.6	
690 <u>+</u>	18	11.5	±0.4	49	±4	4.0	±0.4	
679 <u>+</u>	:12	12.4	±0.5	48	±1	4.0	±0.3	
		11.6		49	±3	3.7	±0.4	
	829 ± 811 ± 820 ± 750 ± 750 ± 779 ± 765 ± 779 ± 838 ± 838 ± 803 ± 803 ± 770 ± 770 ± 770 ± 770 ± 770 ± 702 ± 690 ± 690 ± 690 ± 679 ±	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	P1/[6] 829 ± 27 9.7 811 ± 25 8.7 820 ± 13 11.1 750 ± 25 10.7 779 ± 39 8.6 765 ± 33 9.1 779 ± 20 8.2 816 ± 19 7.6 P1/[7 838 ± 14 12.1 811 ± 30 13.5 803 ± 18 12.1 808 ± 25 13.2 841 ± 18 12.9 770 ± 44 12.4 741 ± 34 11.3 798 ± 38 11.7 P2/[6 702 ± 14 12.6 690 ± 25 13.6 690 ± 18 11.5 679 ± 12 12.4	P1/[60]PCBM* 829 ± 27 9.7 ± 0.8 811 ± 25 8.7 ± 0.7 820 ± 13 11.1 ± 1.6 750 ± 25 10.7 ± 1.0 779 ± 39 8.6 ± 0.6 765 ± 33 9.1 ± 0.5 779 ± 20 8.2 ± 0.4 816 ± 19 7.6 ± 0.5 P1/[70]PCBM* 838 ± 14 12.1 ± 0.4 811 ± 30 13.5 ± 0.9 803 ± 18 12.1 ± 1.1 808 ± 25 13.2 ± 1.2 841 ± 18 12.9 ± 0.7 770 ± 44 12.4 ± 0.5 741 ± 34 11.3 ± 1.0 798 ± 38 11.7 ± 0.4 P2/[60]PCBM* 702 ± 14 12.6 ± 0.5 690 ± 25 13.6 ± 0.9 690 ± 18 11.5 ± 0.4 679 ± 12 12.4 ± 0.5	P1/[60]PCBM* 829 ± 27 9.7 ± 0.8 43 811 ± 25 8.7 ± 0.7 47 820 ± 13 11.1 ± 1.6 45 750 ± 25 10.7 ± 1.0 39 779 ± 39 8.6 ± 0.6 47 765 ± 33 9.1 ± 0.5 43 779 ± 20 8.2 ± 0.4 46 816 ± 19 7.6 ± 0.5 51 P1/[70]PCBM* 838 ± 14 12.1 ± 0.4 50 811 ± 30 13.5 ± 0.9 45 803 ± 18 12.1 ± 1.1 45 808 ± 25 13.2 ± 1.2 48 841 ± 18 12.9 ± 0.7 51 770 ± 44 12.4 ± 0.5 45 741 ± 34 11.3 ± 1.0 42 798 ± 38 11.7 ± 0.4 47 P2/[60]PCBM** 702 ± 14 12.6 ± 0.5 53 690 ± 18 11.5 ± 0.4 49 679 ± 12 12.4 ± 0.5 48	P1/[60]PCBM* 829 ± 27 9.7 ± 0.8 43 ± 4 811 ± 25 8.7 ± 0.7 47 ± 3 820 ± 13 11.1 ± 1.6 45 ± 5 750 ± 25 10.7 ± 1.0 39 ± 3 779 ± 39 8.6 ± 0.6 47 ± 3 765 ± 33 9.1 ± 0.5 43 ± 2 779 ± 20 8.2 ± 0.4 46 ± 2 816 ± 19 7.6 ± 0.5 51 ± 2 P1/[70]PCBM*838 ± 14 12.1 ± 0.4 50 ± 2 811 ± 30 13.5 ± 0.9 45 ± 4 803 ± 18 12.1 ± 1.1 45 ± 2 808 ± 25 13.2 ± 1.2 48 ± 5 841 ± 18 12.9 ± 0.7 51 ± 3 770 ± 44 12.4 ± 0.5 45 ± 3 71/1 45 702 ± 14 12.6 ± 0.5 53 ± 4 690 ± 25 13.6 ± 0.9 48 ± 5 690 ± 12 11.5 ± 0.4 49 ± 4 679 ± 12 12.4 ± 0.5 48 ± 1	P1/[60]PCBM* 829 ± 27 9.7 ± 0.8 43 ± 4 3.4 811 ± 25 8.7 ± 0.7 47 ± 3 3.2 820 ± 13 11.1 ± 1.6 45 ± 5 4.1 750 ± 25 10.7 ± 1.0 39 ± 3 3.2 779 ± 39 8.6 ± 0.6 47 ± 3 3.2 765 ± 33 9.1 ± 0.5 43 ± 2 3.1 779 ± 20 8.2 ± 0.4 46 ± 2 2.9 816 ± 19 7.6 ± 0.5 51 ± 2 3.2P1/[70]PCBM* 838 ± 14 12.1 ± 0.4 50 ± 2 5.1 811 ± 30 13.5 ± 0.9 45 ± 4 4.8 803 ± 18 12.1 ± 1.1 45 ± 2 4.5 808 ± 25 13.2 ± 1.2 48 ± 5 5.1 841 ± 18 12.9 ± 0.7 51 ± 3 5.3 770 ± 44 12.4 ± 0.5 45 ± 3 4.2 741 ± 34 11.3 ± 1.0 42 ± 2 3.6 798 ± 38 11.7 ± 0.4 47 ± 3 4.3P2/[60]PCBM** 702 ± 14 12.6 ± 0.5 53 ± 4 4.6 690 ± 25 13.6 ± 0.9 48 ± 5 4.4 690 ± 18 11.5 ± 0.4 49 ± 4 4.0 679 ± 12 12.4 ± 0.5 48 ± 1 4.0	

Table S1. Characteristics of organic solar cells before and after exposure of the samples to different doses of gamma rays

* - the active layer thickness was 90±5 nm.

** - the active layer thickness was 100±5 nm.