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Conjugated Donor-Acceptor Star Molecules: New Concept for Substantial Dielectric Breakdown Strength Improvement in PVDF Film

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Table 1S. Functional Additives Based on C_{60}, Anthracene and Their Derivatives as well as Some Other Small Molecules for BDS Improvement of Polymer Systems.

Additives	Polymers	Adding content	Enhancement	Testing conditions	Ref
C60	XLPE	0.1 wt%	15%	AC	[15]
	PP	0.1 wt%	21%	DC	[16]
	Epoxy	0.6 wt%	30%	AC	[17]
$PC_{60}BM$	XLPE	0.1 (0.05) wt%	26 (32)%	AC	[15]
Anthracene	LDPE	0.1 wt%	50%	DC	[18]
Anthracene modified SiO_2	PP	2 wt%	15%	DC and AC	[19]
Azo compounds	LDPE	0.1 wt%	50%	DC	[20]
Benzophenone derivatives	XLPE	1 wt%	13.5%	AC	[21]
Thioxanthone derivatives	XLPE	~ 0.3 wt%	55%	AC	[22]
Acridine derivatives	XLPE	~ 0.76 wt%	18.4%	AC	[23]
Benzil derivatives	XLPE	~ 1 wt%	62%	AC	[24]
D-A star-shaped molecules	PVDF-t	0.1 wt%	27%	DC	This work

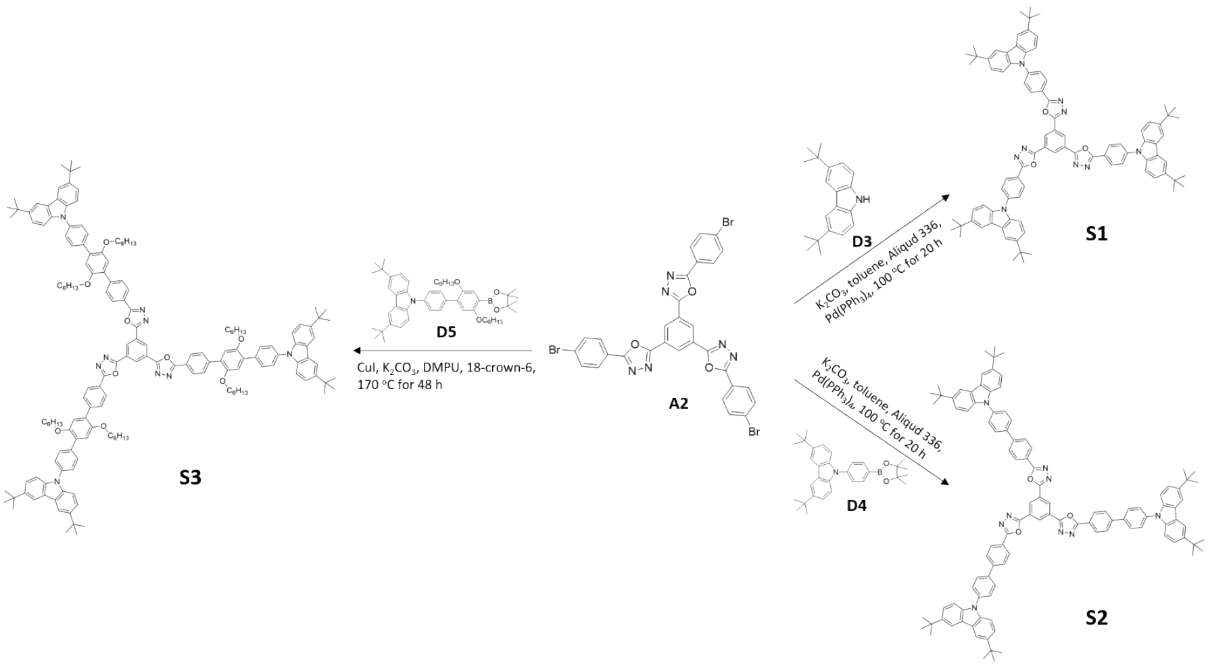

Figure S1. Schematic of preparation and molecular structures of S1, S2 and S3.

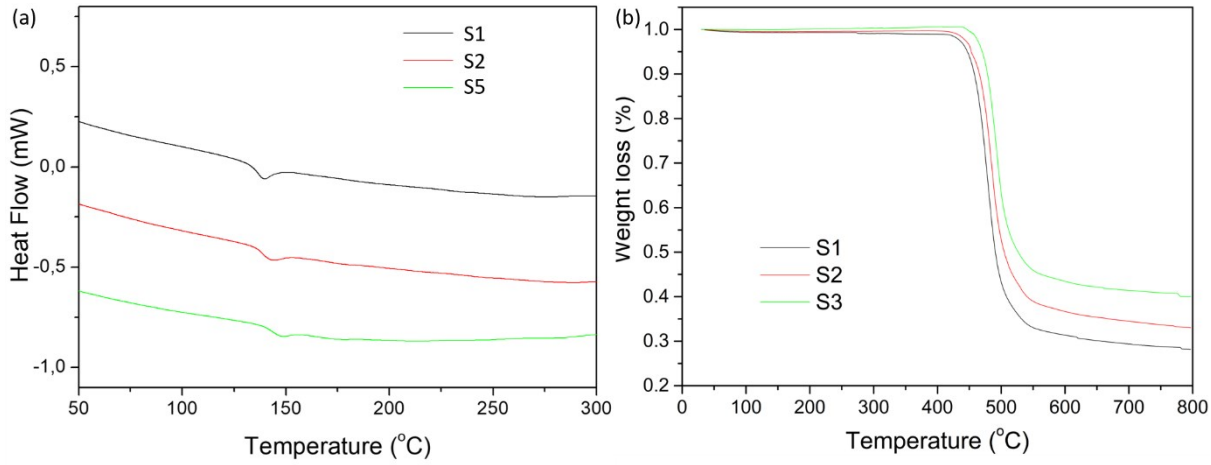

Figure S2. (a) DSC and (b) TGA curves of S1, S2 and S3 under N_2 atmosphere.

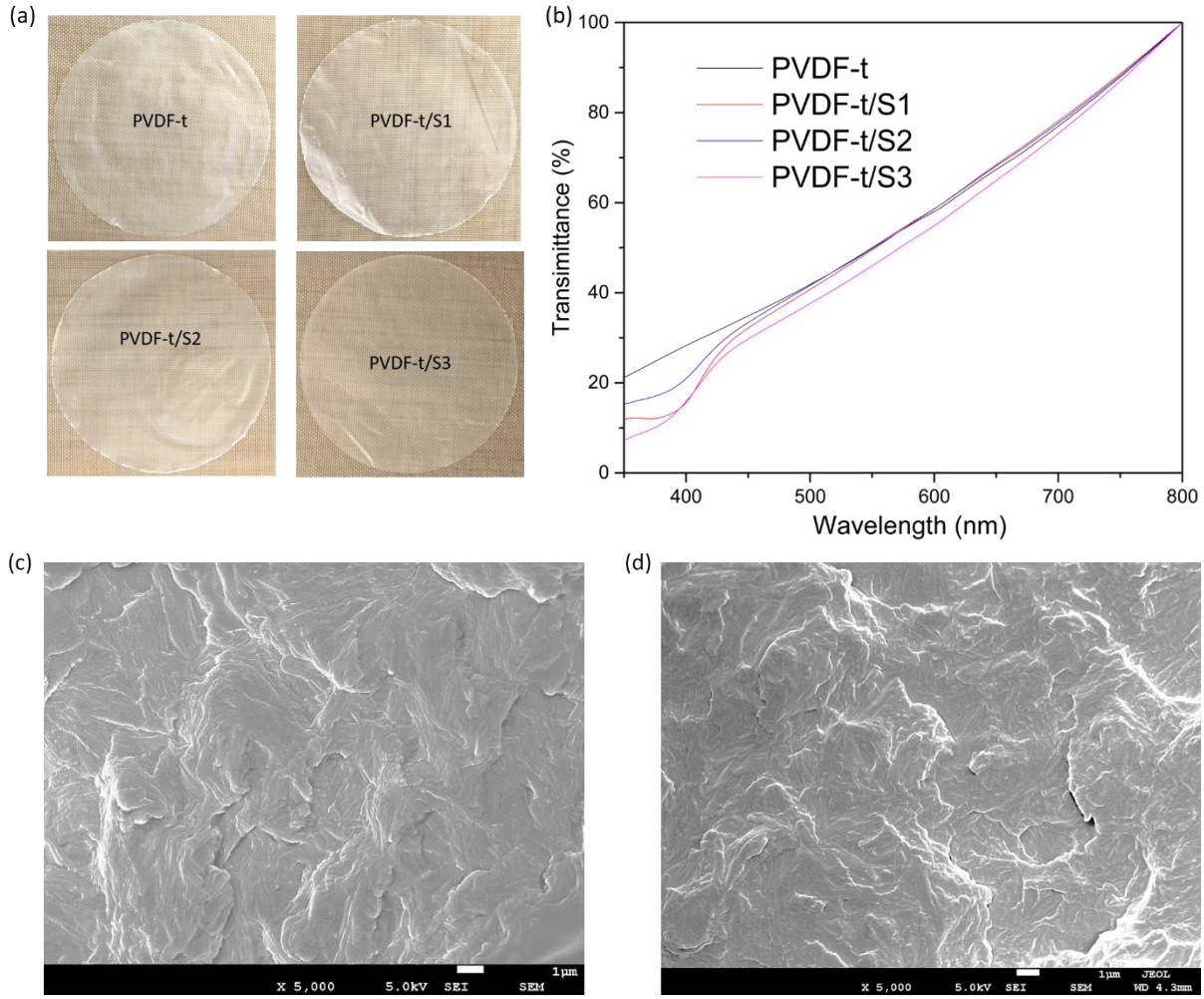

Figure S3. (a) Optical images and (b) transmittance spectra of neat PVDF-t and PVDF-t/S1-S3 films. SEM images of cross section of polymer films of (c) neat PVDF-t and (d) PVDF-t/S3(0.1 wt%).

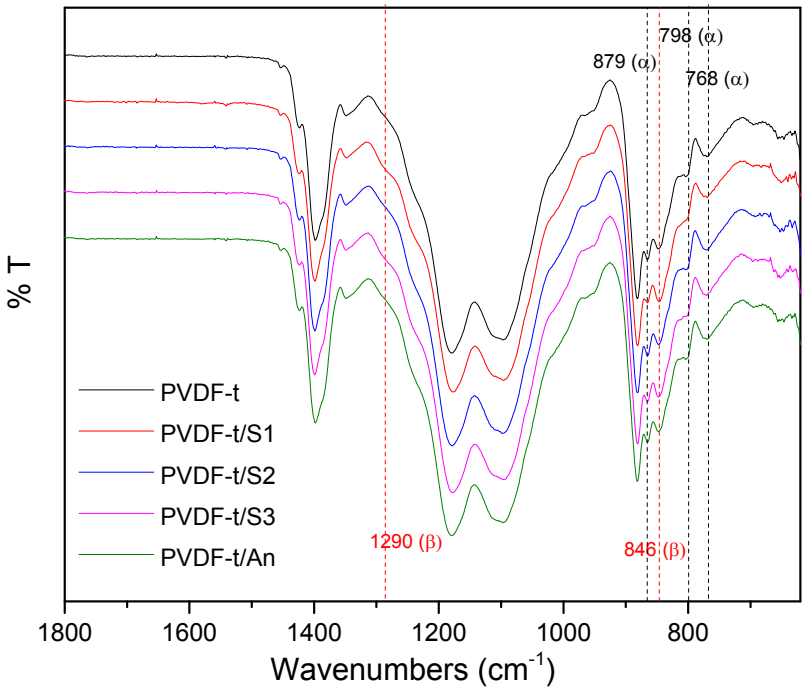

Figure S4. FT-IR spectra of PVDF-t with the additives of small molecules in 0.1 wt%.

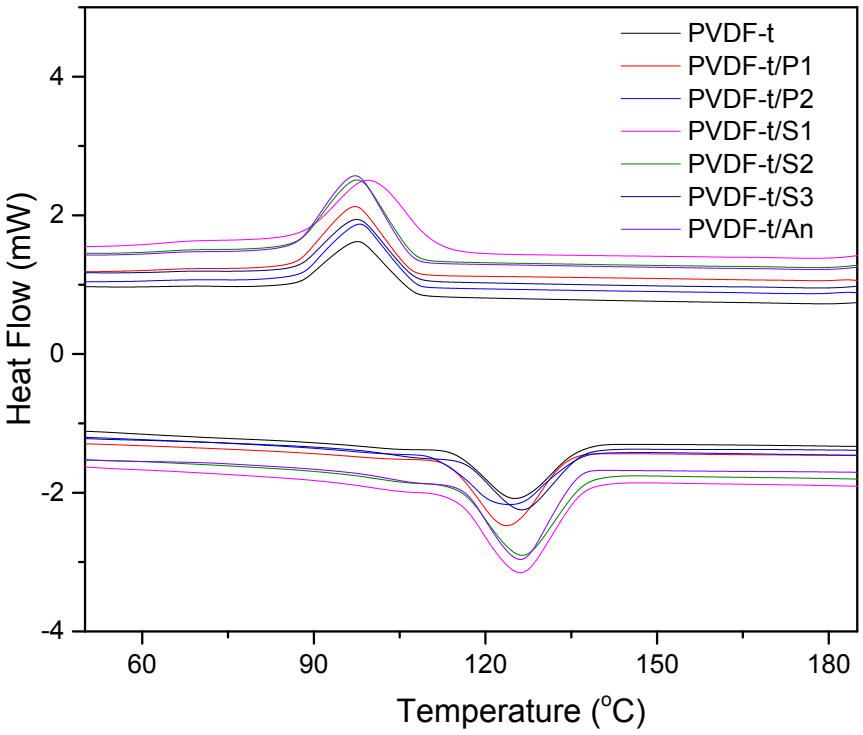

Figure S5. DSC curves of PVDF-t polymer films with the additives in 0.1 wt%.

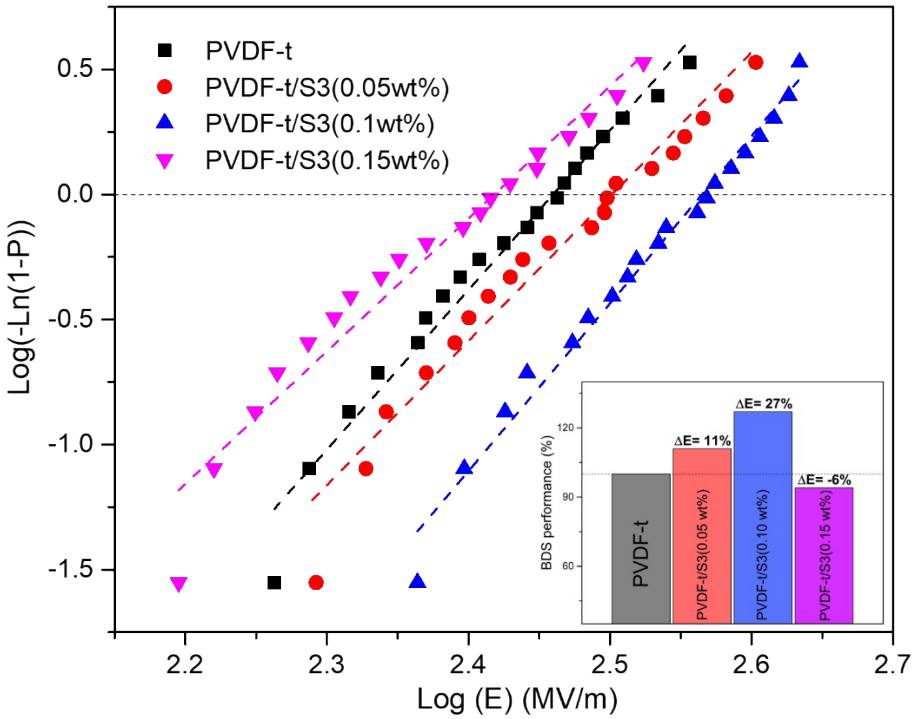

Figure S6. Weibull distribution of BDS of neat PVDF-t film and PVDF-t film containing S3 in 0.05, 0.1 and 0.15 wt%. inset: BDS performance of PVDF-t film with the S3 additives.