

ARTICLE

Supplementary Information

1 High-Temperature Energy Storage Performance of BOPP Film<sup>8</sup>

Tab.1-1 Maximum Discharge Energy Density of BOPP Film ( $\eta > 90\%$ )

Temperature(°C)	BOPP(J/cm <sup>3</sup> )	Modified Laminated BOPP Structure(J/cm <sup>3</sup> )
25	3.9-4.1	4.6-5.0
75	1.5-1.7	3.6-4.0
100	0.8-1.0	3.7-3.9
125	0.08	1.5-1.7

2 Specific Parameters of the Weibull Distribution for Breakdown Strength and Flashover Voltage

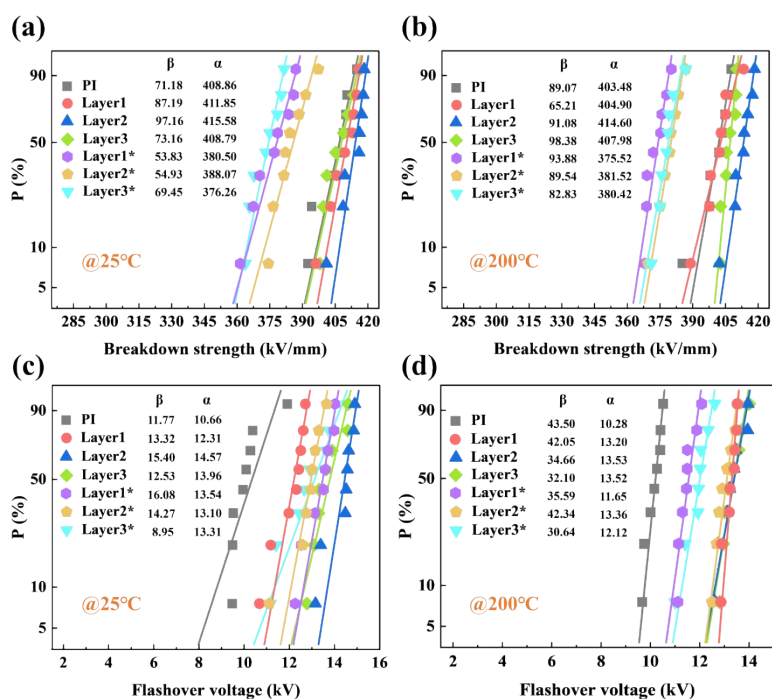


Fig. 2-1 (a, b) Breakdown strength at 25° C and 200° C; (c, d) Flashover voltage at 25° C and 200° C. 3 Peak-Fitting Results for the Trap-Level Distributions of the Sample Groups

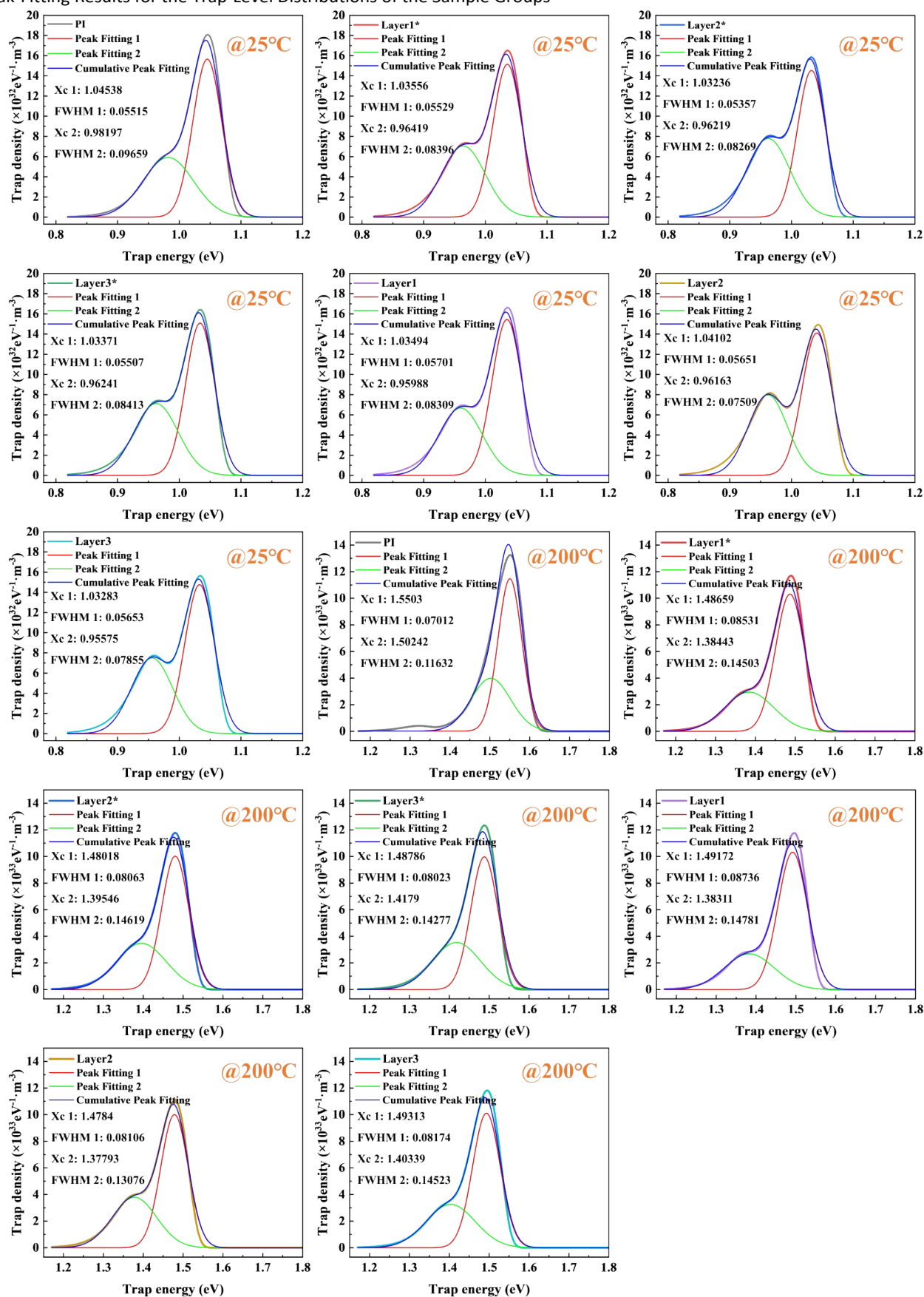


Fig. 3-1

4 Hysteresis Loops of Various Samples under Different Electric Field Strengths

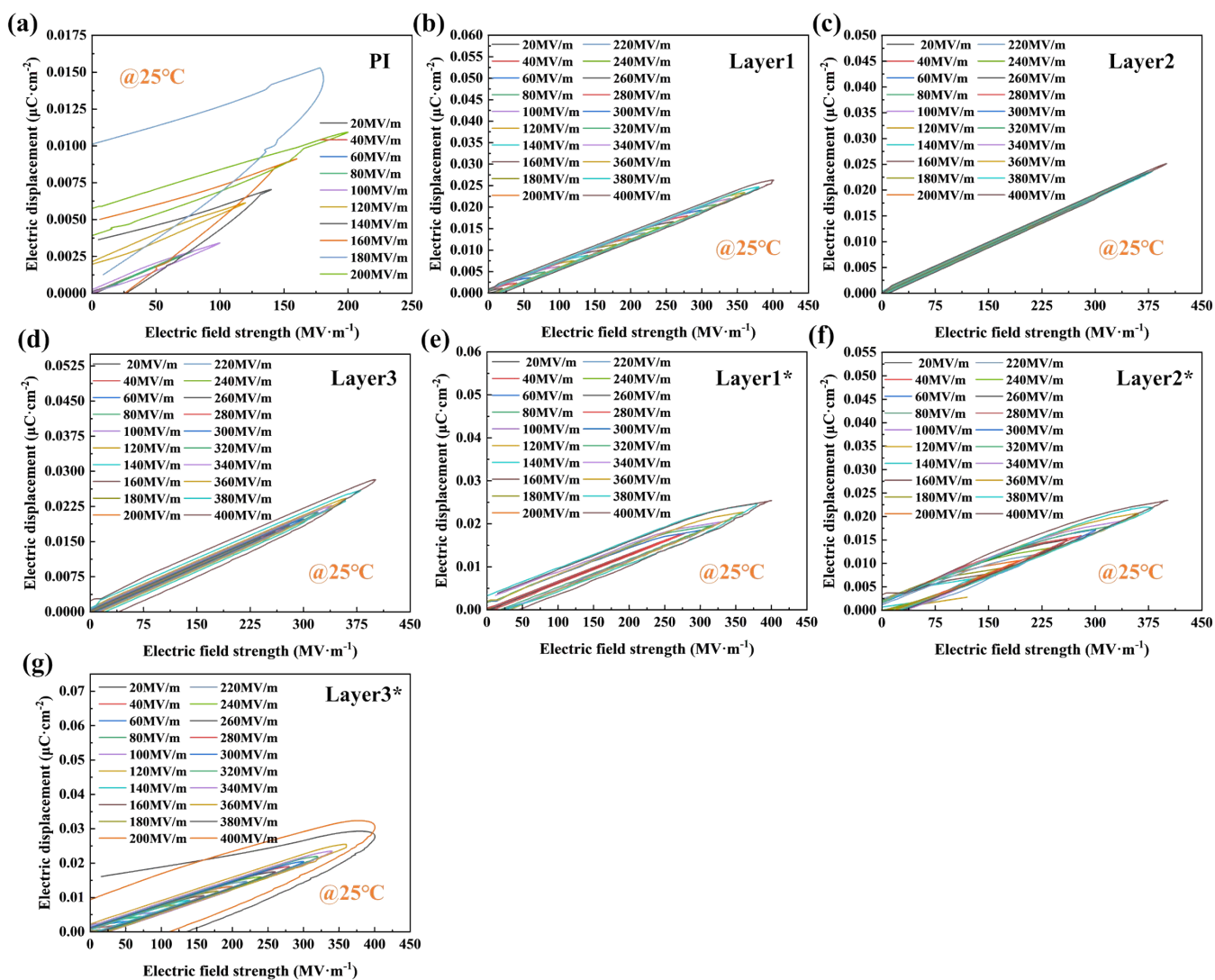
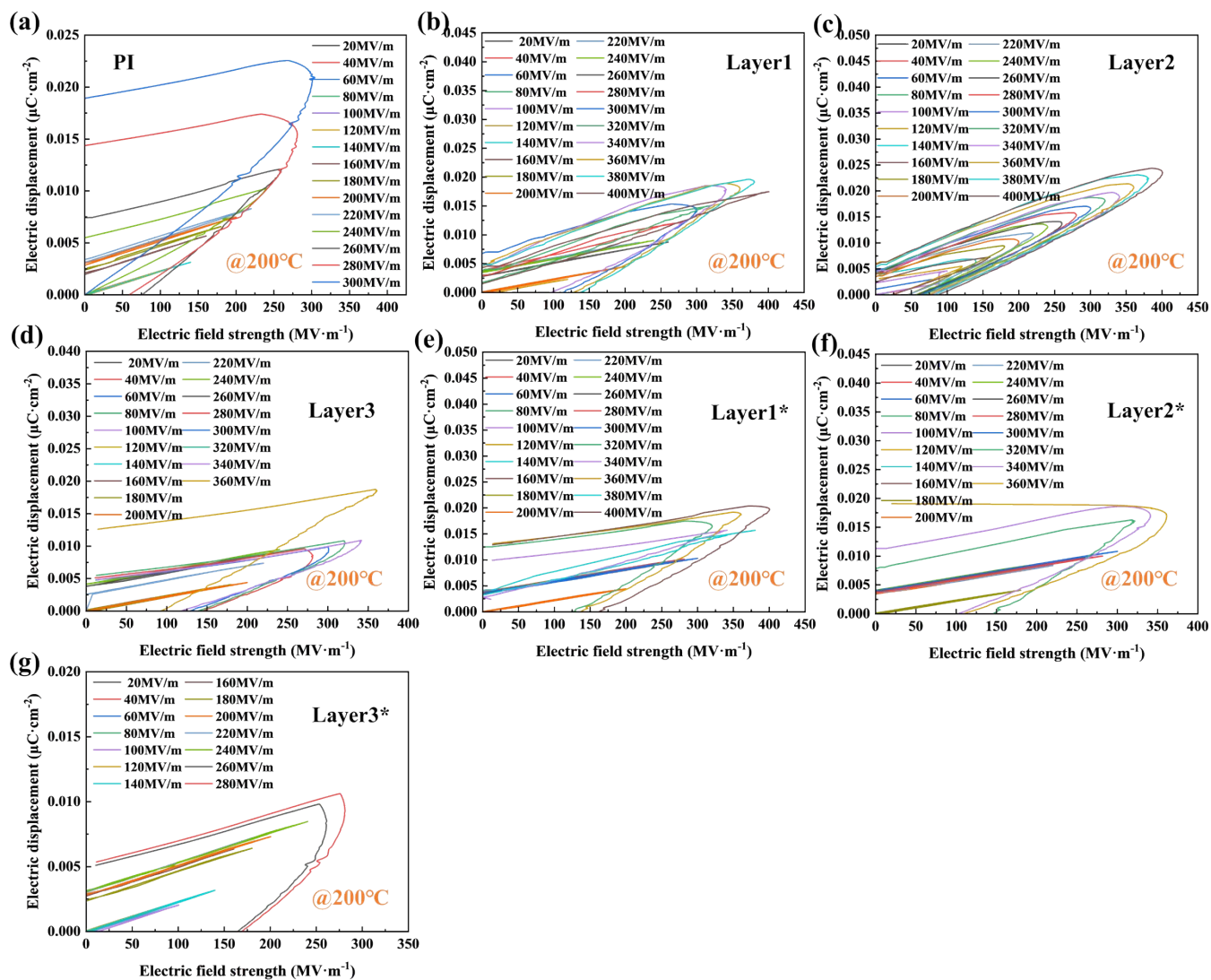


Fig. 4-1 25°C

Fig. 4-2  $200^\circ\text{C}$ 

## 5 Fatigue Testing

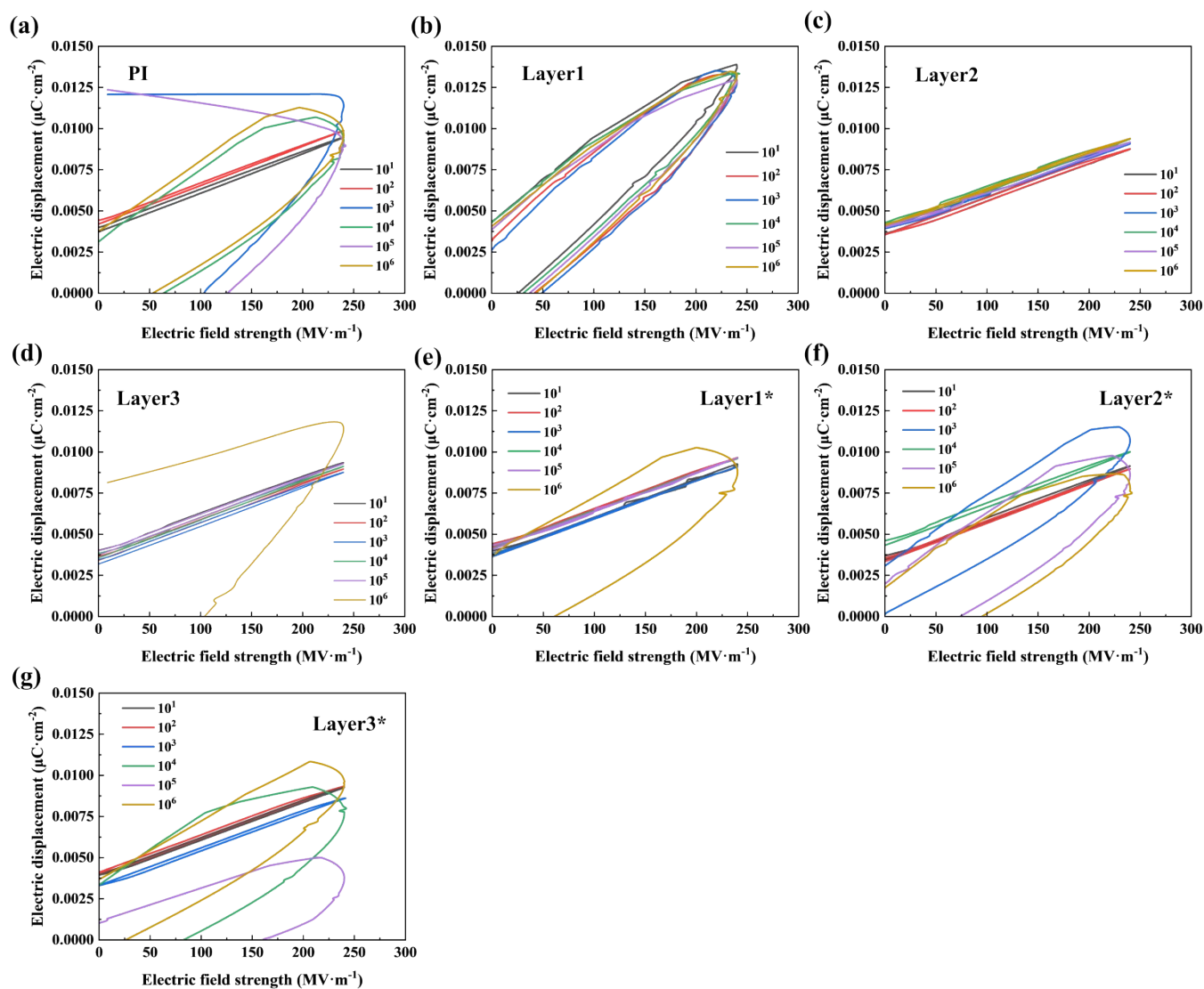


Fig. 5-1

6 This paper employs the **Materials Studio** software to perform simulation calculations on plasma-treated PI molecules, the interfacial phase molecules formed with DGEBA, and the BST@S core-shell structure; the relevant calculation modules and molecular models are presented below.

### 6.1 Construction of Models for Potential Structures and Functional Group Grafting Sites of PI Molecules Following Plasma Oxidation

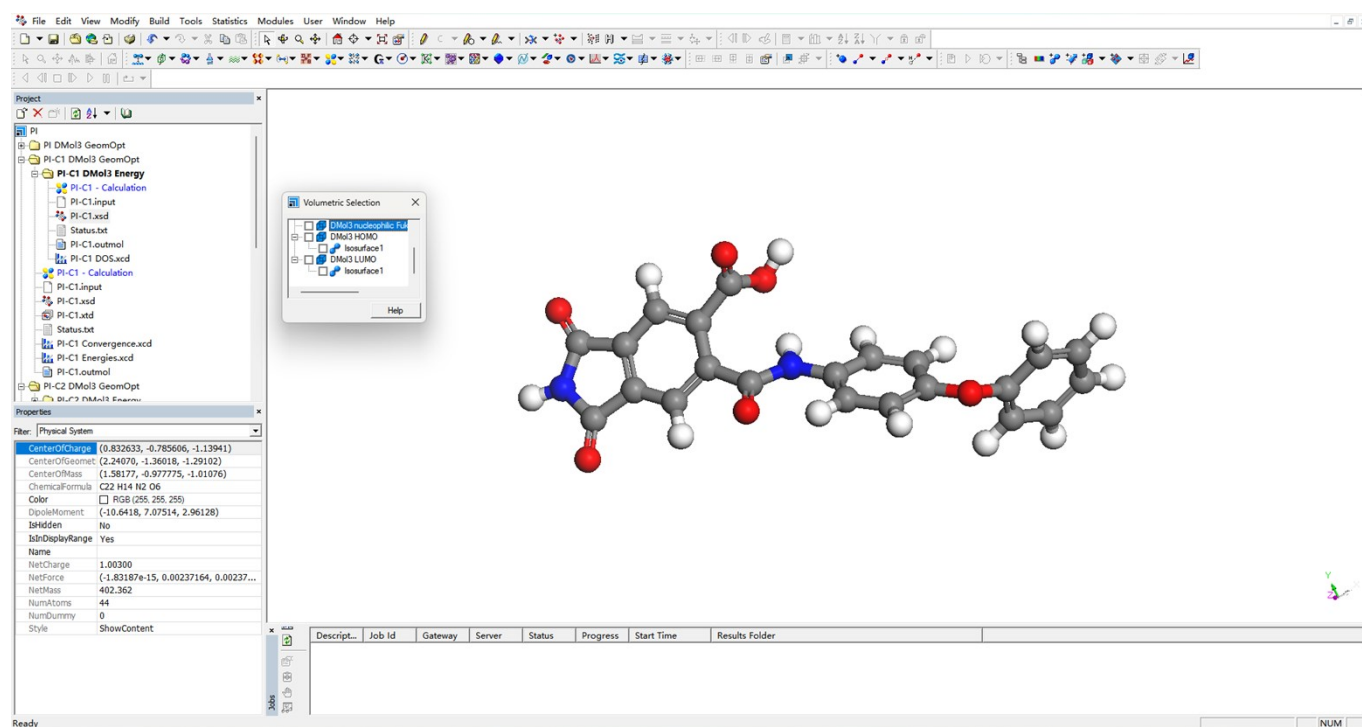


Fig. 6-1

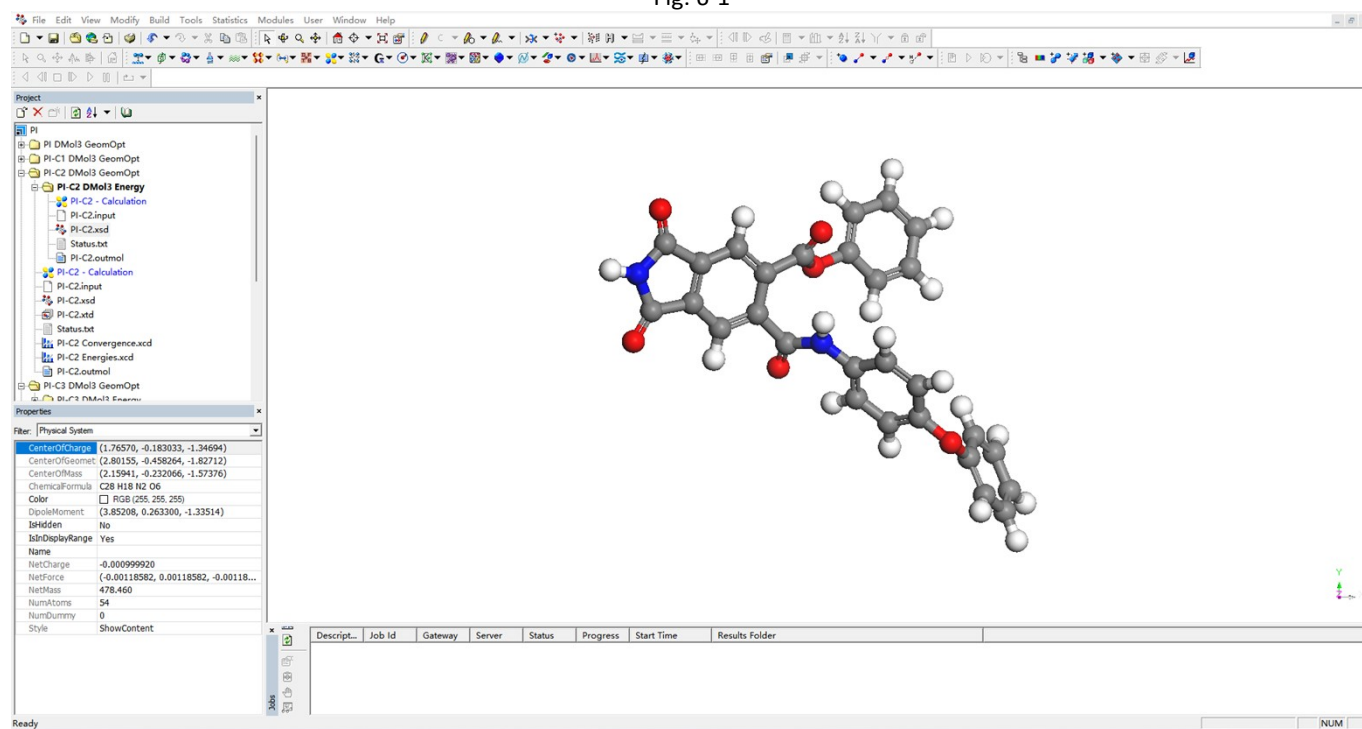


Fig. 6-2

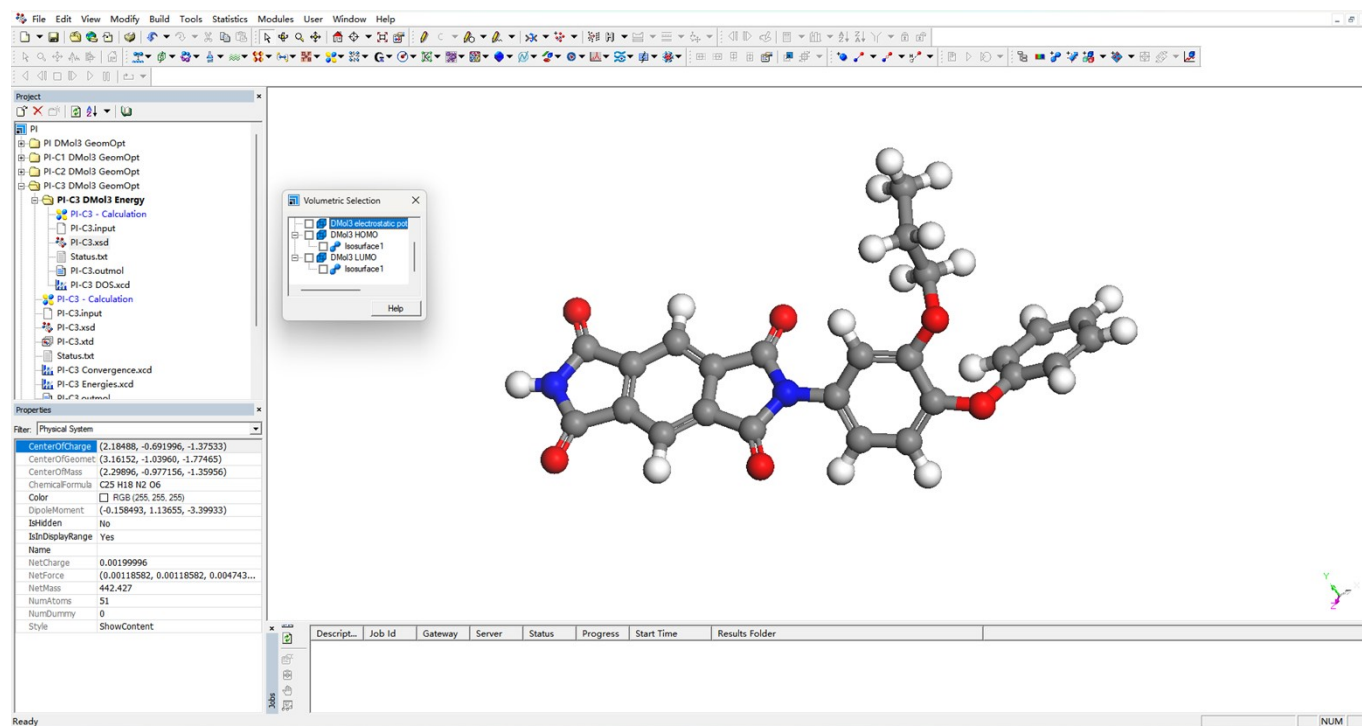


Fig. 6-3

## 6.2 Utilizing the DMol3 Module to Calculate Parameters Such as the Molecular Electrostatic Potential and Frontier Orbitals of the PI-DGEBA Interface Phase

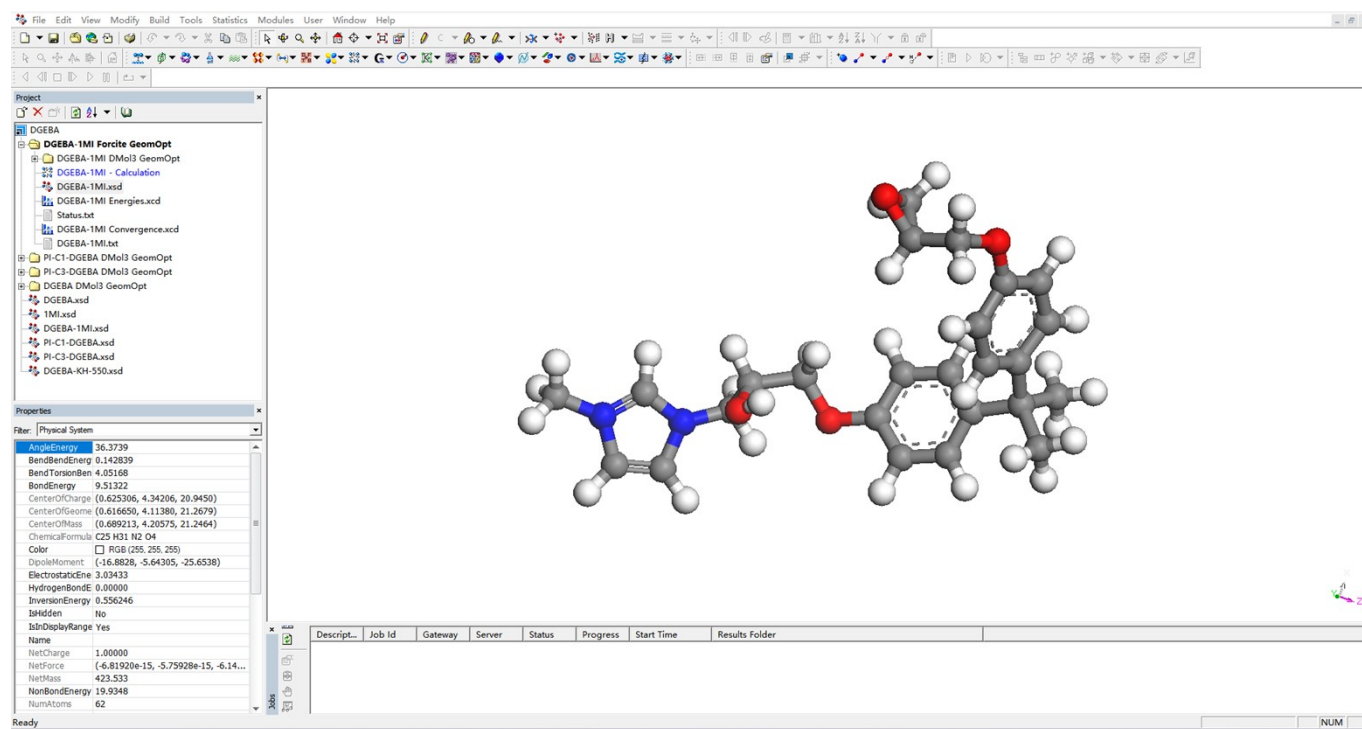


Fig. 6-4 1MI-DGEBA

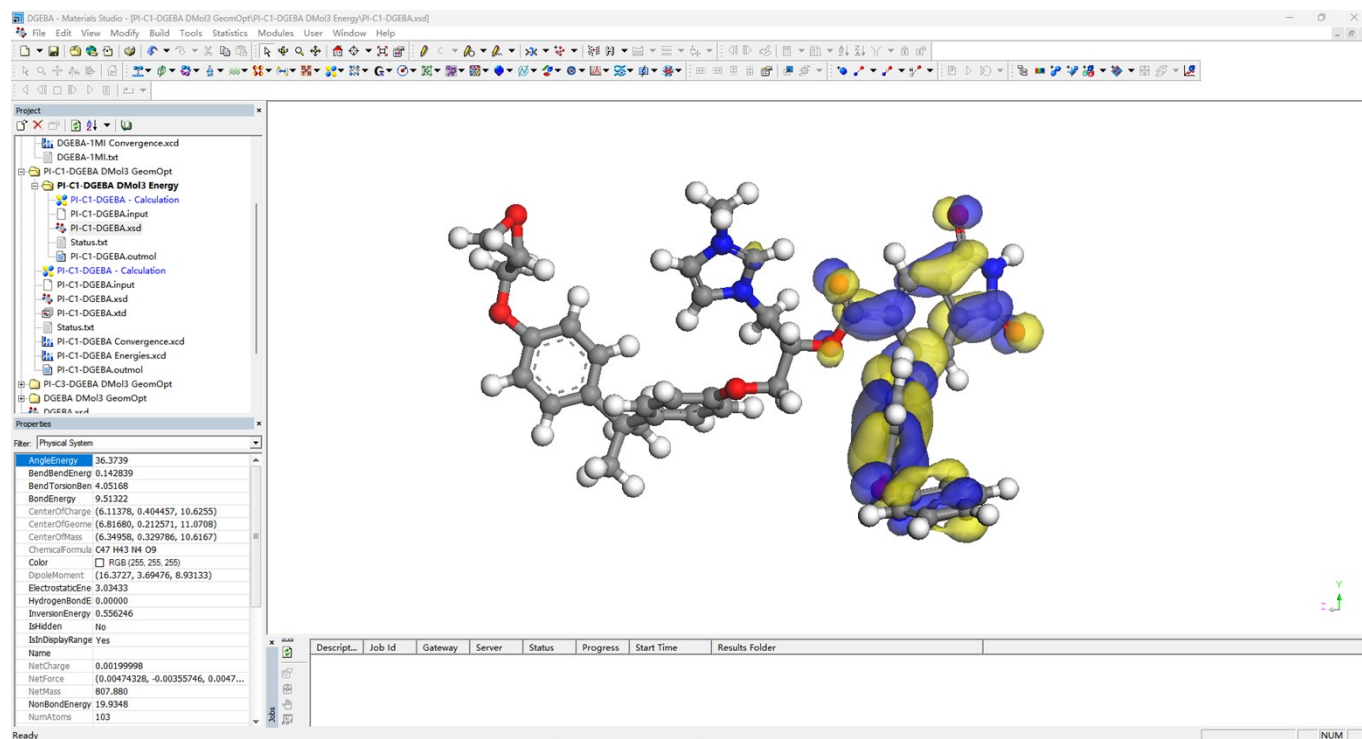


Fig. 6-5 PI-1MI-DGEBA

### 6.3 Constructing a BST@S-KH550 Interfacial Model Using the Amorphous Cell Module

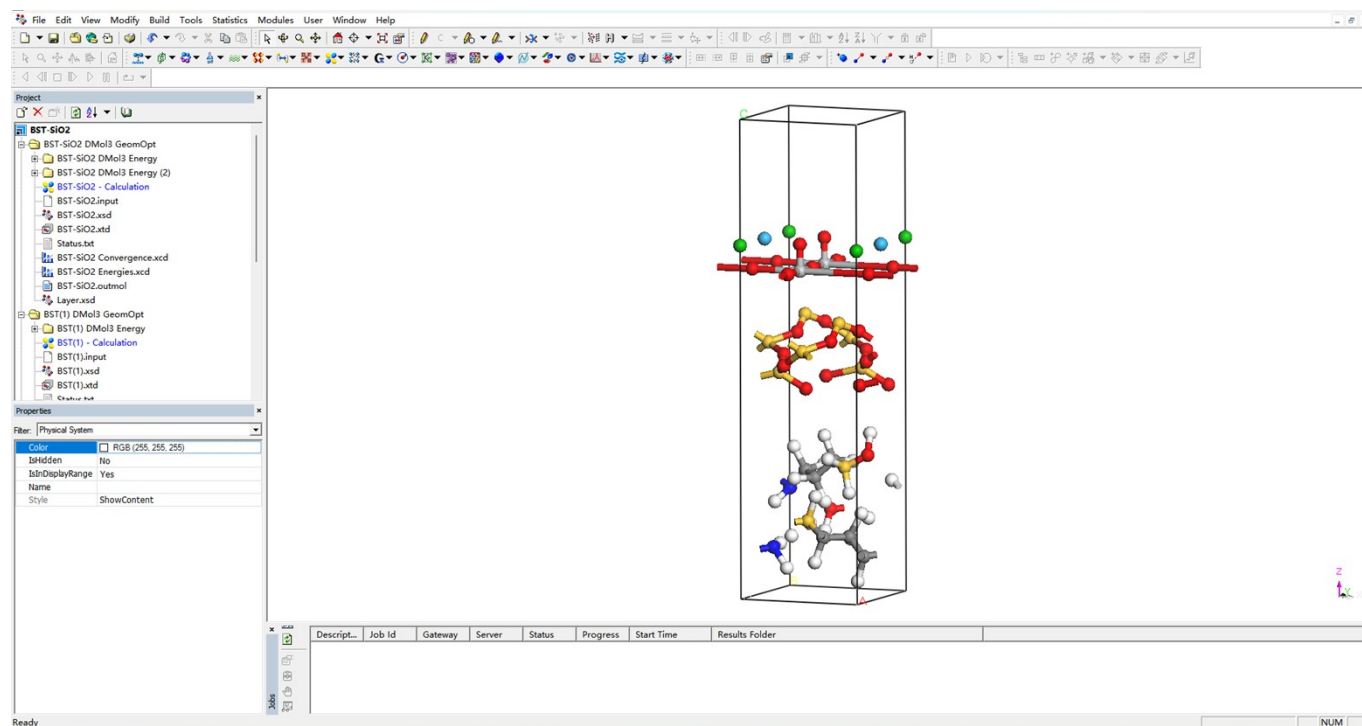


Fig. 6-6

### 6.4 Calculate the Binding Energy Between Interfaces of BST@S-KH550 Using the Forcite Module

File Edit View Modify Build Tools Statistics Modules User Window Help

Project: BST-SiO2

- Layer DMol3 GeomOpt
- BST-SiO2-KH-550 Forcite GeomOpt
  - BST-SiO2-KH-550 Forcite Dynamics
    - Interaction Energy
      - InteractionEnergy Script
        - final.xtd
        - InteractionEnergy.pl.out
        - all.txt
        - InteractionEnergy.pl
        - Layer1.txt
        - Layer2.txt
        - Layer\_IntEnergy.std
        - InteractionEnergy.pl
        - final.xtd

	A	B	C	D	E	F	G	H	I	J
	Layer Cell	Energy of Layer Cell	Layer 1	Energy of Layer 1	Layer 2	Energy of layer 2	Interaction Energy	Interaction Energy per angstrom <sup>2</sup>		
34	all	1.610910e+006	Layer1	42.24227087	Layer2	1.610876e+006	-8.69394339	-0.16840478		
35	all	1.662607e+006	Layer1	55.82966594	Layer2	1.662560e+006	-8.49172965	-0.16448783		
36	all	1.647156e+006	Layer1	85.22582841	Layer2	1.647077e+006	-5.88220565	-0.11394042		
37	all	1.735229e+006	Layer1	75.02083285	Layer2	1.735158e+006	-4.64759022	-0.09002548		
38	all	1.688777e+006	Layer1	58.90970943	Layer2	1.688728e+006	-9.83618107	-0.19053033		
39	all	1.796081e+006	Layer1	68.04389940	Layer2	1.796024e+006	-11.14178664	-0.21582038		
40	all	1.881987e+006	Layer1	39.19919799	Layer2	1.881931e+006	17.15023701	0.33220621		
41	all	1.938455e+006	Layer1	62.26454502	Layer2	1.938401e+006	-8.62023206	-0.16697697		
42	all	2.251583e+006	Layer1	60.14421184	Layer2	2.251531e+006	-8.34840813	-0.16171164		
43	all	2.366035e+006	Layer1	54.00662881	Layer2	2.365986e+006	-4.97626300	-0.09639199		
44	all	2.600313e+006	Layer1	47.50836130	Layer2	2.600271e+006	-5.58628518	-0.10820834		
45	all	2.447018e+006	Layer1	45.35304978	Layer2	2.446973e+006	0.02015970	3.905005e-004		
46	all	2.309126e+006	Layer1	54.56243710	Layer2	2.309083e+006	-10.85966824	-0.21035565		
47	all	2.305256e+006	Layer1	52.93258602	Layer2	2.305214e+006	-10.61620987	-0.20563977		
48	all	2.375401e+006	Layer1	53.86624353	Layer2	2.375357e+006	-8.94251422	-0.17321969		
49	all	2.349696e+006	Layer1	58.27498784	Layer2	2.349648e+006	-9.87474792	-0.19127739		
50	all	2.639770e+006	Layer1	47.26304195	Layer2	2.639731e+006	-7.34699842	-0.14231388		

Sheet 1

Description	Job Id	Gateway	Server	Status	Progress	Resu
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Fig. 6-7

## 7 Film Thicknesses of Each Group

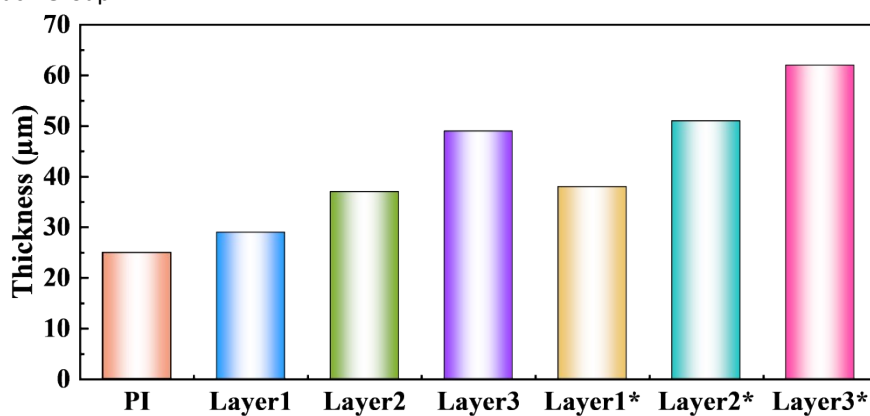


Fig. 7-1