

Supplementary Material

Synthesis of Two Novel Neutral Polymeric Bonding Agents for Enhancing Mechanical Properties of Composite Solid Propellants

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Table S1 ^1H NMR assigned peaks of two neutral polymeric bonding agents

NPBA-1	^1H NMR (500MHz,DMF-d7)	NPBA-2	^1H NMR (500MHz,DMF-d7)
OH*	5.05-4.85	CO ₂ CH ₂ *	4.45-4.65
OCH ₂ *CH ₂ OH	4.30-4.18	CO ₂ CH ₂ *	4.05-3.85
OCH ₂ CH ₂ *OH	3.82-3.74	S-CH ₂ CH ₂ *OH	3.78-3.65
CH ₂ CH ₂ *OH	3.74-3.70	CNCH ₂ *CH ₂ OCH ₂ CH ₂ *OCH ₂	3.45-3.20
CH ₂ CH ₂ *CN	3.45-3.10	OCH ₂ CHOCH ₂ * SCH ₂ *CH ₂ OH	2.88-2.76
CH ₂ CH ₂ *COO	3.00-2.88	CHCNCH ₂ *CH ₂ *C CH ₃ CO	2.40-2.00
CH ₂ *CHCOO S-CH ₂ *CH ₂ OH	2.88-2.79	CH ₂ CCH ₃ *COO	1.55-1.30
CH ₂ *CHCN	2.40-1.80		

Table S2 ^{13}C NMR assigned peaks of two neutral polymeric bonding agents

NPBA-1	^{13}C NMR (125MHz, DMSO-d7)	NPBA-2	^{13}C NMR (125MHz, DMSO-d7)
$\text{C}^*=\text{O}$	174.8-174.0	$\text{C}^*\text{O}_2\text{CH}_2$	125.9-175.1
C^*N	121.6-120.6	C^*N	121.6-120.3
OC^*H_2	67.8-67.0	$\text{OC}^*\text{H}_2\text{CHOCH}_2$	67.2-66.7
$\text{S}-\text{C}^*\text{H}_2\text{OH}$	62.8-62.6	$\text{S}-\text{CH}_2\text{C}^*\text{H}_2\text{OH}$	62.9-62.6
$\text{OC}^*\text{H}_2\text{CH}_2\text{OH}$	60.6-60.4	C^*HOCH_2	50.0-49.8
$\text{CH}_2\text{C}^*\text{HCOO}$	42.7-42.3	$\text{CH}_2\text{CH}_3\text{C}^*\text{COO}$	46.4-46.1
$\text{C}^*\text{H}_2\text{CHCOO}$	36.1-35.8	CHOC^*H_2	45.2-49.8
$\text{C}^*\text{H}_2\text{CHCN}$	34.7-34.0	$\text{C}^*\text{H}_2\text{CH}_3\text{C}$	36.2-35.9
$\text{CH}_2\text{C}^*\text{HCN}$	29.7-28.1	$\text{C}^*\text{H}_2\text{CHCN}$	34.8-34.1
$\text{S}-\text{C}^*\text{H}_2\text{CH}_2\text{OH}$	15.5-15.3	$\text{CH}_2\text{C}^*\text{HCN}$	29.8-28.1
		$\text{CH}_2\text{C}^*\text{H}_3\text{CCOO}$	21.0-20.8
		$\text{S}-\text{C}^*\text{H}_2\text{CH}_2\text{OH}$	15.6-15.3

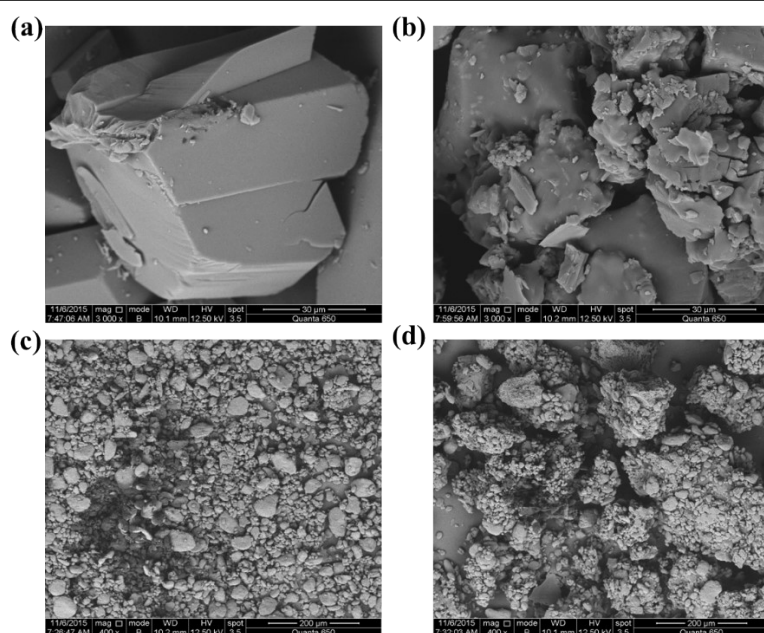


Figure S1. the morphologies of HMX (a) before and (b) after coating by NPBA-2. The morphologies of RDX (c) before and (d) after coating by NPBA-2.

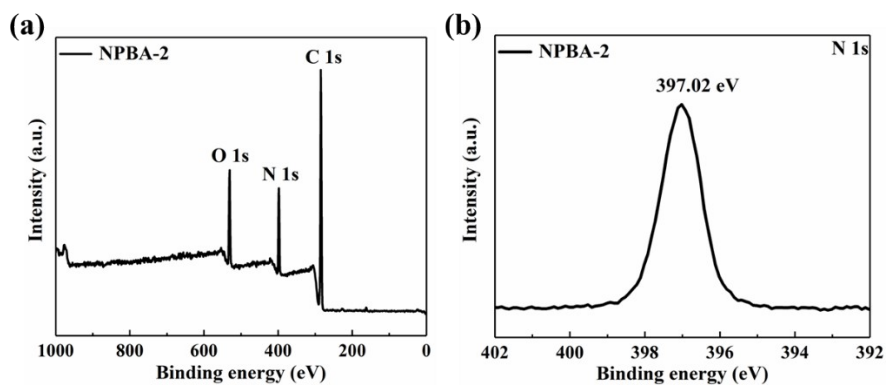


Figure S2. (a) The XPS spectrum of pure NPBA-2. (b) The N 1s XPS spectrum of pure NPBA-2.