Supporting Information

Unrevealling the Effect of Anthraquinone Metal Salts as Wide-Range Plateau Catalyst to Enhance the Combustion Properties of Solid Propellants

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1. Characterization of AMS

(1) 1, 8-dihydroxyanthraquinone lead **(DHAAPb):** "Black powder; yield, 4.21g (94.6%); IR (KBr, υ, cm^{-1}), 3455, 1640, 1584, 1520, 1190, 981, 821, 749, 636; Anal. Found, C 37.73, H 1.349; Calcd., C 37.75, H 1.348. XRF Found, Pb 46.49, Calcd.: Pb 46.52."

(2) 1, 8-dihydroxyanthraquinone copper **(DHAACu)**: "Red powder; yield, 5.90g (97.8%); IR (KBr, υ, cm^{-1}), 3450, 1658, 1579, 1530, 1196, 978, 823, 746, 633; Anal. Found, C 49.76, H 2.965; Calcd., C 49.78, H 2.963; XRF Found, Cu 20.98, Calcd. , Cu 21.06."

(3) 1, 8-dihydroxy-4, 5-dinitroanthraquinone lead (**DHDNEPb**): "Brown powder; yield, 5.10 g (95.3%). IR (KBr, υ, cm^{-1}): 3062, 1704, 1608, 1520, 1431, 1335, 1287, 1214, 990, 837, 693. Anal. Found, C 31.38, H 0.750, N 5.21; Calcd, C 31.40, H 0.748, N 5.23; XRF Found, Pb 38.68, Calcd.: Pb 38.70."

(4) 1, 8-dihydroxy-4, 5-dinitroanthraquinone copper (**DHDNECu**): "Red powder; yield, 3.71 g (94.5%); IR (KBr, υ, cm^{-1}), 3055, 1678, 1598, 1504, 1428, 1331, 1289, 1210, 987, 840, 685; Anal. Found, C 42.90, H 1.024, N 7.14; Calcd. C 42.91, H 1.022, N 7.15; XRF Found, Cu 16.20, Calcd., Cu 16.22."

(5) 1, 4, 5, 8-tetrahydroxyanthraquinone lead (**TOCKPb**): "Black powder; yield, 6.72 g (97.4%); IR (KBr, υ, cm^{-1}), 3044, 1561, 1509, 1176, 968, 802, 734, 628; Anal. Found, C 23.98, H 0.858; Calcd., C 24.00, H 0.857; XRF Found, Pb 59.66, Calcd., Pb 60.70."

(6) 1, 4, 5, 8-tetrahydroxyanthraquinone copper (**TOCKCu**): "Red powder; yield, 3.72 g (94.2%); IR (KBr, υ, cm^{-1}), 3040, 1565, 1507, 1180, 972, 810, 738, 632; Anal. Found, C 42.51, H 1.014; Calcd., C 42.53, H 1.013; XRF Found, Cu 32.11, Calcd., Cu 32.15."

2. The data of burning rate (u) of DB propellants with different catalysts

Table S1 The burning rate of DB propellants with different catalysts

	The u ($mm \cdot s^{-1}$) of DB propellants with different catalysts at different pressure(MPa)								
No.	2	4	6	8	10	12	14	16	18
Control 1	2.15	3.59	5.2	6.49	7.81	8.99	9.77	10.38	11.22
DB01	3.20	5.52	7.72	9.48	11.32	10.90	11.06	11.85	12.89
DB02	2.82	3.76	5.17	6.50	8.16	9.03	10.01	10.67	11.11
DB03	3.45	7.13	10.17	11.79	14.12	14.40	14.69	14.60	15.06
DB04	3.02	4.29	5.80	7.59	9.24	10.05	11.41	12.29	13.02
DB05	6.42	10.61	12.76	13.81	14.92	14.73	14.81	14.23	14.43

3. The data of burning rate (u) of RDX-CMDB propellants with different catalysts

Table S2 The burning rate of DB propellants with different catalysts

	The u ($mm \cdot s^{-1}$) of RDX-CMDB propellants with different catalysts at different pressure(MPa)								
No.	2	4	6	8	10	12	14	16	18
Control 2	3.09	5.34	7.42	9.85	11.88	14.04	15.75	17.54	19.23
CMDB01	7.45	11.03	12.82	13.63	14.12	14.69	15.39	16.70	17.60
CMDB02	8.47	13.08	15.02	15.61	15.52	15.40	15.79	17.12	17.93
CMDB03	6.27	10.50	13.30	14.61	15.45	15.88	16.70	18.21	19.36
CMDB04	6.44	11.34	14.52	16.10	16.65	16.62	17.06	18.34	19.44
CMDB05	9.53	14.05	16.20	17.50	18.45	18.96	19.50	20.41	21.10
CMDB06	10.02	14.84	17.33	19.05	20.18	21.01	21.6	22.32	22.86

4. The data of catalysis property camparation previous and our advanced catalysts for RDX-CMDB propellants

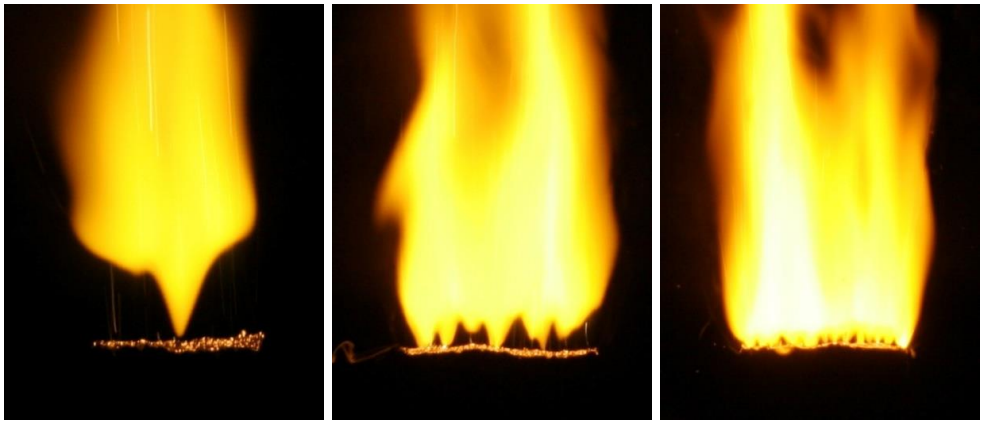
Table 3 The catalysis property camparation previous and our advanced catalysts for RDX-CMDB propellants

Catalysts	Plateau region (MPa)	Width of plateau (MPa)	Burning rate on plateau ($mm \bullet s^{-1}$)
φ-Pb	4-10	6	7.90
φ-Pb/β-Cu	6-12	6	10.2
NP/AC	4-8	4	9.00
nNP/nAC	6-12	6	13.73
PbGal	2-8	6	7.11
BTATZPb	4-12	8	9.70
DNPPb	6-10	4	10.97
TOCKPb	6-18	12	18.87
TOCKPb/TOCKCu	6-18	12	20.62

5. Combustion flame structures of RDX-CMDB propellants with different catalysts

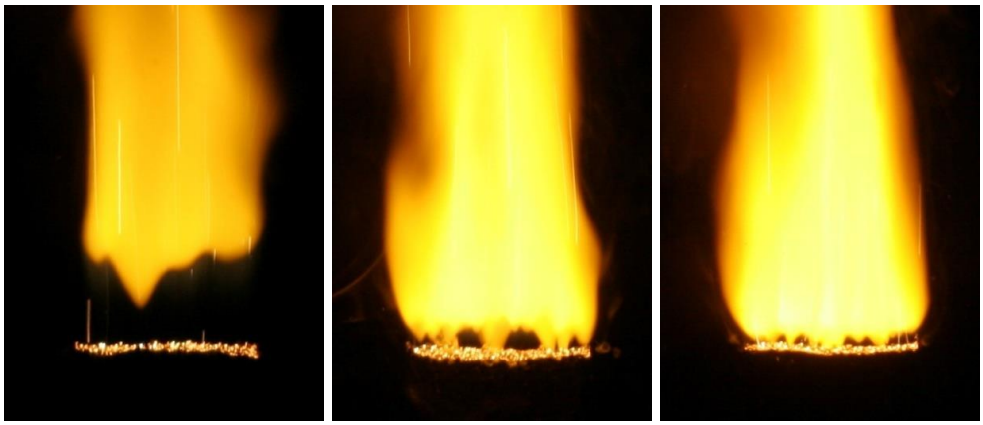
2MPa 4MPa 6MPa

Figure S1. Combustion flame structures of RDX-CMDB propellants with DHAAPb



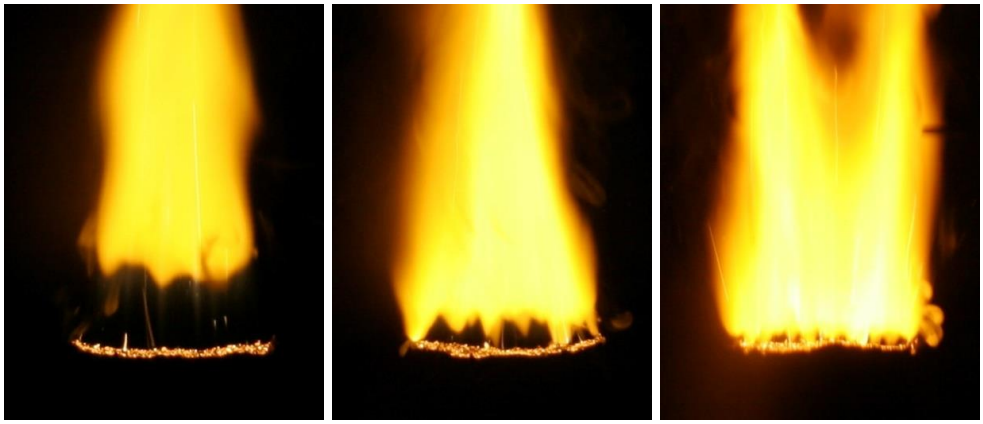
2MPa 4MPa 6MPa

Figure S2. Combustion flame structures of RDX-CMDB propellants with DHAAPb/DHAACu



2MPa 4MPa 6MPa

Figure S3. Combustion flame structures of RDX-CMDB propellants with DHDNEPb



2MPa 4MPa 6MPa

Figure S4. Combustion flame structures of RDX-CMDB propellants with DHDNEPb/DHDNECu

2MPa 4MPa 6MPa

Figure S5. Combustion flame structures of RDX-CMDB propellants with TOCKPb