Surpporting Information

Antifouling Behavior of Self-Renewal Acrylate Boron Polymers with Pyridine-Diphenylborane Side Chains

Yakun Li,[a, b] Rongrong Chen,[a, b] YanHua Feng,[c] Lianhe Liu,[a, c] Xun Sun,[a] Liang Tang,[a] Kazunobu Takahashi,[a] Jun Wang*[a]*

a Key laboratory of Superlight Material and Surface Technology, Ministry of Education, Harbin Engineering University, 150001, China. E-mail: chenrongrong95@163.com; junwang@hrbeu.edu.cn.

b Institute of Advanced Marine Materials, College of Materials Science and Chemical Engineering, Harbin Engineering University, Harbin 150001, China.

c Qingdao Advanced Marine Material Technology Co., Ltd, Qingdao, 266100, China.

Results and discussion

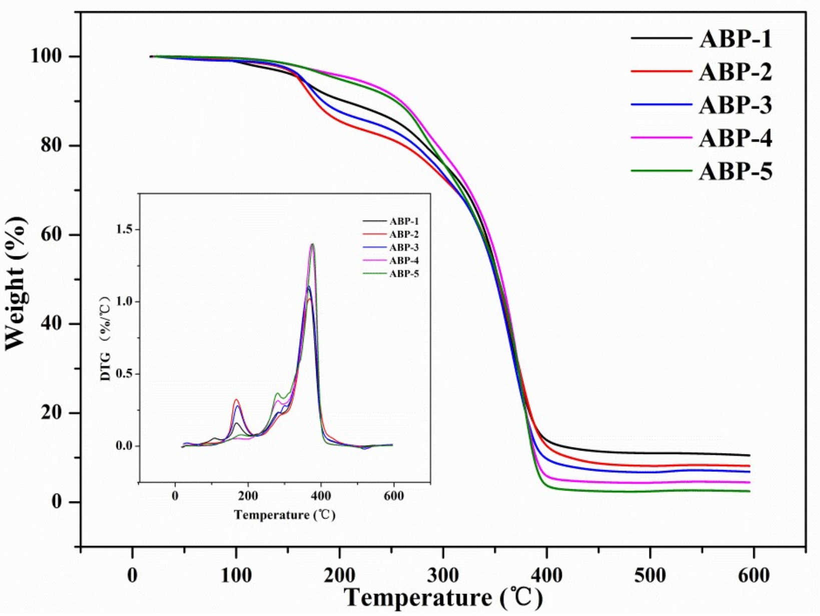

Fig. S1 TGA and DTG (inset) curves of different ABPs.

Fig. S1 illustrates the TG and DTG curves of ABPs at a heating rate of 20 K·min^{-1} under an inert atmosphere. Three weight loss stages were encountered in the thermal degradation of the ABPs, with a main decomposition, which occurred from 320 to 450 °C, corresponding to the degradation initiated from random C-C bond scission in the backbone. In addition, the first degradation, which occurred from 132 to 220 °C, corresponds to the evaporation of residual solvent. The second weak degradation, which occurred from 231 to 333 °C, could be indicative of a chain scission of the ester bond of the side-chain radical. In addition, ABP-5, which had the most ester group, possessed the biggest peak area in the temperature interval from 231 to 333 °C in DTG analysis. The content of residual char was in keeping with the decrease in PTPB, which demonstrated that PTPB was successfully reacted with the AAPs.

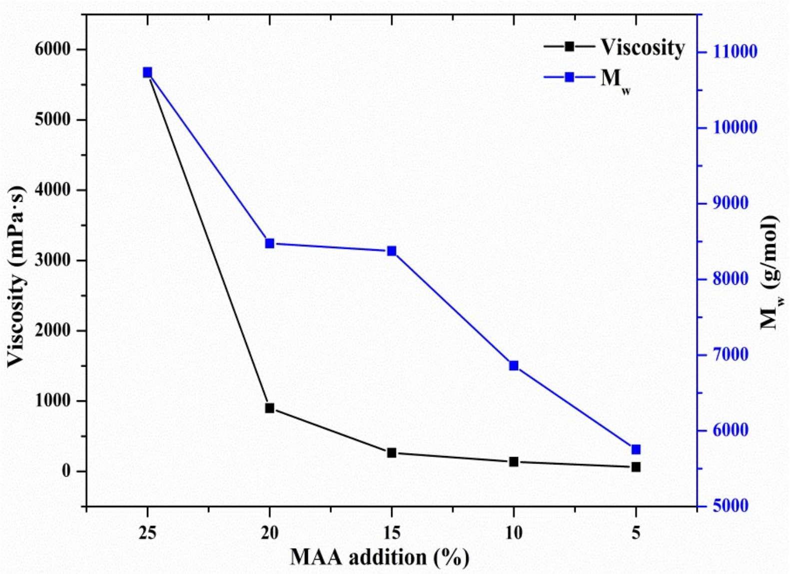

Fig. S2 Variation trend of viscosity and molecular weight between different ABPs

In the synthesis of the acrylate acid polymers, the amount of MAA was decreased from AAP-1 to AAP-5; therefore, more PTPB was added to react with the acrylate acid polymers in the synthesis of ABP-1 than in the synthesis of ABP-5. The additional large hydrolysable pendant groups in ABP-1 compared to those in ABP-5 hinder the migration of the segments and molecular chain, which reflected the increased intermolecular force of friction on the microscale and increased viscosity on the macroscale from AAP-1 to AAP-5.

Molecular weight was measured to characterize the structure of ABPs. As shown in Fig. S2, the molecular weight decreased from ABP-1 to ABP-5, the same trend that was observed with the viscosity from AAP-1 to AAP-5, the carboxyl group content declined with the MAA content, and the number of functional groups in the backbone for PTPB to react with declined, which lead to the decrease in molecular weight of the ABPs. Therefore, all the data indicated that the PTPB successfully reacted with the acrylate acid polymers through protonolysis reactions.

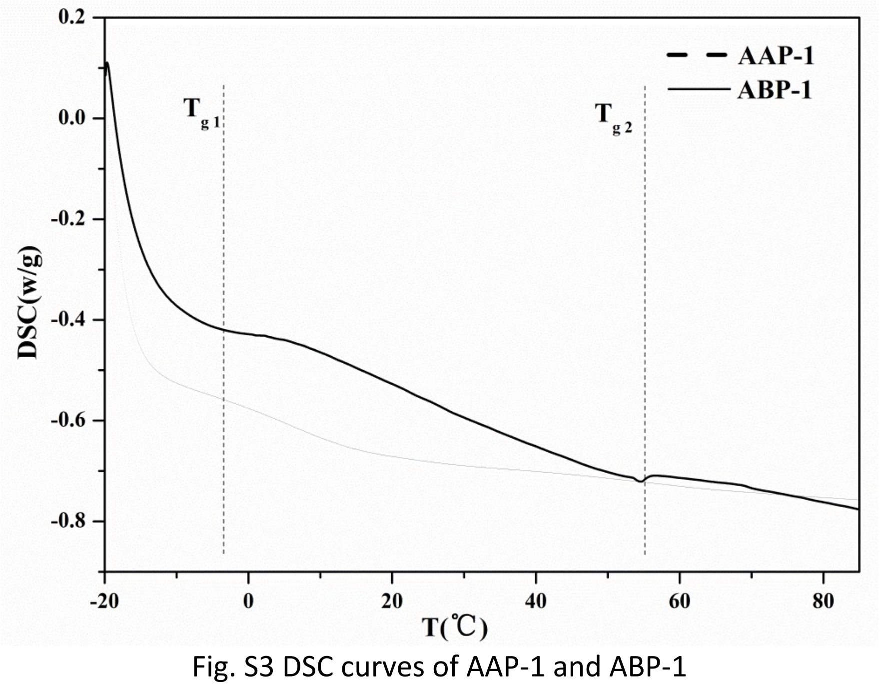

Fig. S3 DSC curves of AAP-1 and ABP-1

In order to explain the micro-phase separation in the results of SEM test, DSC test was added to check the Tg of AAP-1 and ABP-1. The result was depicted as Fig. S3. After the introduction of hydrophobic diphenyl borane pyridine side groups, the

ABP-1 had one more Tg than AAP-1, which also showed that the introduction of boron-containing monomer caused the microphase separation.