**Supplementary** **Information**

**Hongwei Hea,b\*, Pengfeng Wua,b, Zeguang Yanga,b, Zhihao Shia,b, Wenwen Yua,b, Fuyong Liu a,b, Fengbo Zhua,b, Qiang Zhenga,c\*, Dezhong Zhangd,e, Shumin Lid,e**

a College of Materials Science ＆ Engineering, Taiyuan University of Technology, Taiyuan, 030024, China; w15235179072@126.com (P. Wu); m15534053294@163.com (Z. Yang)**;** 18100340949@163.com (Z. Shi); yuwenwen@tyut.edu.cn (W. Yu); liufuyong@tyut.edu.cn (F. Liu); zhufengbo@tyut.edu.cn (F. Zhu)

b Key Laboratory of Interface Science and Engineering in Advanced Materials, Ministry of Education, Taiyuan University of Technology, Taiyuan 030024, China

c Ministry of Education Key Laboratory of Macromolecular Synthesis and Functionalization, Department of Polymer Science and Engineering, Zhejiang University, Hangzhou, 310027, China

d Huayang New Material Technology Group Co., Ltd, China; zhangdezhongaaaa@163.com (D. Zhang); ymqnjkccyfzx@163.com (S. Li))

e YMC Navalley (Shanxi) Aerogel Science and Innovation City Management Co., Ltd, China

\*To whom correspondence should be addressed

Email address: hehongwei4103@126.com (H. He), zhengqiang@zju.edu.cn (Q. Zheng).

Table S1 The formula of traditional RFL dipping solution.

|  |  |  |
| --- | --- | --- |
| Component | Dry weight(g) | Wet weight(g) |
| Resorcinol | 11.0 | 11.0 |
| Formaldehyde | 6.0 | 16.2 |
| Sodium hydroxide | 0.3 | 3.0 |
| Deionized water | - | 235.8 |
| Maturation: 25℃, 6h | 17.3 | 266.0 |
| Ammonia (28%) | - | 11.3 |
| Deionized water | 0 | 59.2 |
| Vinyl-pyridine latex (40%) | 100 | 250 |
| Maturation: 25℃, 20h | 117.3 | 586.5 |

Table S2 The Rubber Compound Composition.

|  |  |
| --- | --- |
| Component | Content (Phr) |
| SBR | 70 |
| NR | 30 |
| Aromatic oil | 15 |
| Antioxidant (4010NA) | 1.5 |
| Carbon black (N330) | 30 |
| Adhesive RS (Compound of resorcinol and stearic acid) | 1.5 |
| Silica | 15 |
| ZnO | 5 |
| CZ Accelerator CZ(N-Cyclohexyl-2-truxene thiazole sulfonamide) | 4 |
| SA (Stearic acid)) | 2 |
| RA Adhesive (2,4,6-Tris[bis(methoxymethyl)amino]-1,3,5-triazine) | 1.5 |
| Sulfur | 1 |
| Toatal | 186.5 |