

**Multi-coloration of polyurethane derivatives through click postfunctionalization,  
electrochemical oxidation, and Ag<sup>+</sup> ion complexation**

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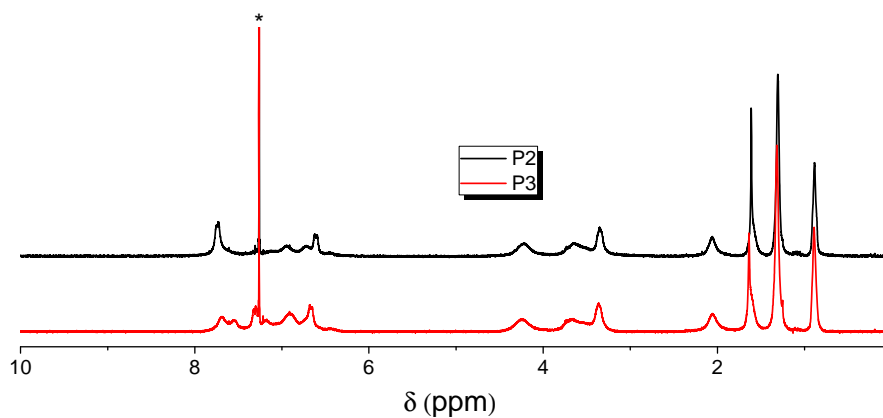
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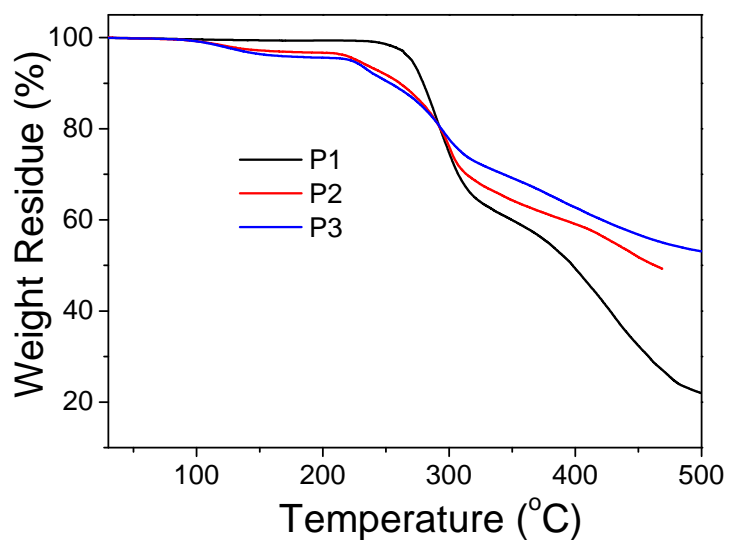
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## 1. $^1\text{H}$ NMR spectra



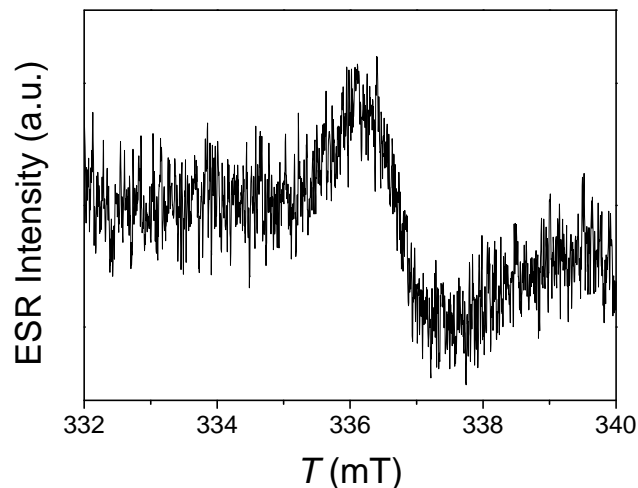
**Fig. S1**  $^1\text{H}$  NMR spectra of **P2** and **P3** in  $\text{CDCl}_3$  at 20 °C.

## 2. Thermogravimetric analysis (TGA)

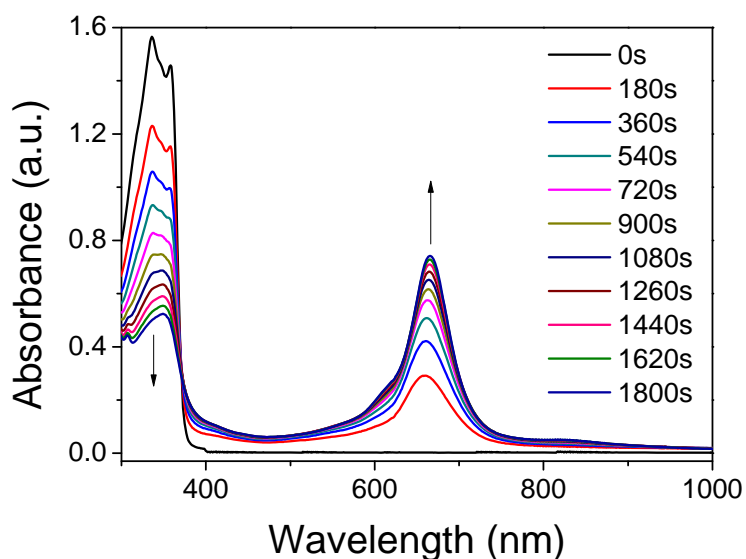


**Fig. S2** Thermogravimetric analysis of **P1-P3** at the heating rate of  $10\text{ °C min}^{-1}$  under flowing nitrogen.

### 3. Electrochemical oxidation



**Fig. S3** ESR spectrum of the **P1** thin film on an ITO-coated glass plate by applying 0.25 V for 300 s. The spectrum was recorded one day after the oxidation. The ITO-coated glass plate did not show any ESR signals under the same conditions.

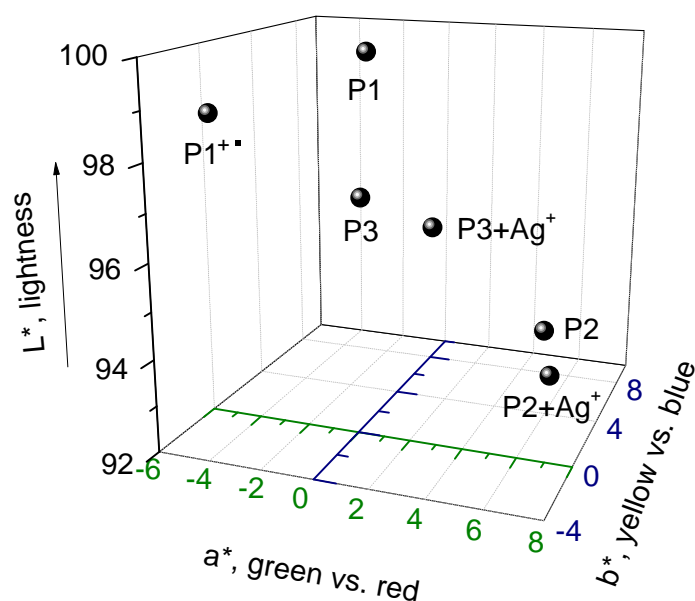


**Fig. S4** UV-vis-near IR spectral change of **P1** solution in  $\text{CHCl}_3$  containing 0.1 M  $(n\text{C}_4\text{H}_9)_4\text{NClO}_4$  by applying a controlled potential of 0.25 V at 20 °C. Platinum mesh was used as a working electrode.

#### 4. Colorimetry

**Table S1** Summary of  $L^*a^*b^*$  values for the polyurethane derivatives in  $\text{CHCl}_3$  (300  $\mu\text{M}$  repeat unit<sup>-1</sup>)

	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P2+Ag<sup>+</sup></b>	<b>P3+Ag<sup>+</sup></b>	<b>P1<sup>+</sup></b>
$L^*$	100	82.65	71.37	63.55	71.55	89.68
$a^*$	0	23.13	-23.48	58.16	-7.86	-14.48
$b^*$	0	76.52	31.72	13.54	50.51	-7.14



**Fig. S5** Three-dimensional  $L^*a^*b^*$  plots of values for the polyurethane thin films with the thickness of about 1  $\mu\text{m}$ : **P1**, **P2**, **P3**, **P2** complex with  $\text{Ag}^+$  ions (**P2+Ag<sup>+</sup>**), **P3** complex with  $\text{Ag}^+$  ions (**P3+Ag<sup>+</sup>**), and electrochemically-oxidized state of **P1** by 0.25 V application for 0.5 h (**P1<sup>+</sup>**).

**Table S2** Summary of  $L^*a^*b^*$  values for the polyurethane thin films<sup>a</sup>

	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P2+Ag<sup>+</sup></b>	<b>P3+Ag<sup>+</sup></b>	<b>P1<sup>+</sup></b>
L*	99.86	94.12	95.85	93.56	95.27	99.88
a*	-0.36	6.11	-3.19	6.79	0.01	-4.31
b*	1.81	3.05	7.98	1.27	8.10	-2.54

<sup>a</sup> Film thickness of about 1  $\mu\text{m}$ .