

# Development of azo dye *in situ* layers using aminonaphthol sulfonic acid coupling derivatives

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## 1. Introduction

The preparation technique of self-assembled multi-layer films may provide new feasibilities to achieve the manufacture of ultrathin films at nano-technology application. Also, it is quite effective skill to obtain the ideal model surface whose properties are controllable. Commonly, multi-levels of polyelectrolyte layers are prepared by alternate electrostatic layer-by-layer adsorption or electrostatic self-assembly of polyions. The electrostatic attraction between oppositely charged molecules seems to be a good driving force for multi-layer build-up. There has been great attention to understand the mechanism and principle of the self-assembly multi-layer films<sup>1-3</sup>.

In this work, we described the preparation of multi-dye layer thin films formed by alternating deposition of diazonium resin and aminonaphthol sulfonic acid compounds.

## 2. Experimental

### 2.1 Preparation of the diazonium resin

The diazonium resin compounds using the polycondensation of 4-diazodiphenylamine sulfate with paraformaldehyde were prepared to device multi-layer fabrication films on the glass plate. The general preparation scheme of diazonium resin<sup>2,3</sup> is shown in Fig. 1.

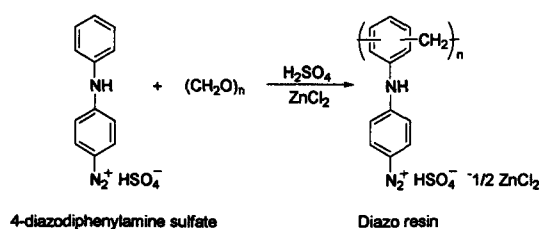


Fig. 1. Preparation of diazonium resin.

## 2.2 Coupling reaction with aminonaphthol sulfonic acid compounds

The structure of the various aminonaphthol sulfonic acid compounds shown in Fig. 2. The coupling reaction of diazonium resin and various aminonaphthol sulfonic acid compounds was conducted. The fabrication of diazonium resin and aminonaphthol sulfonic acid compounds composite assemblies is schematically illustrated in Fig. 3.

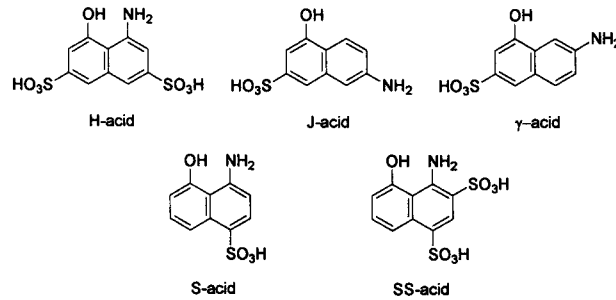


Fig. 2. The structure of aminonaphthol sulfonic acid compounds.

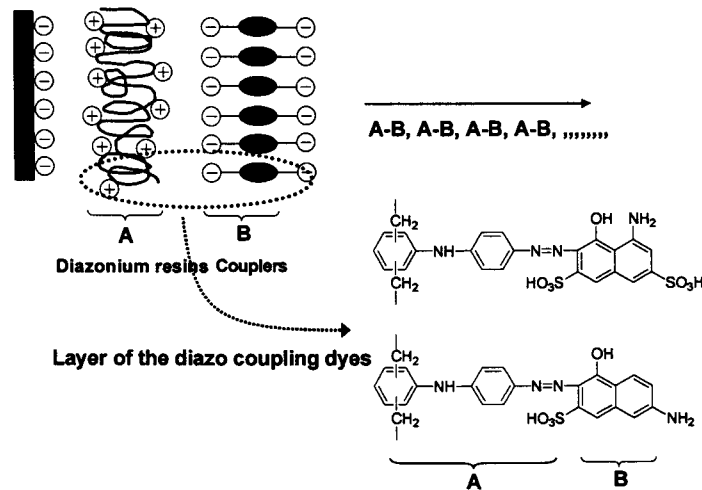


Fig. 3. Scheme of the self-assembled fabrication dye films.

## 3. Results and discussion

In this study, the self-assembled multi-dye layer underwent diazo coupling reaction at the same time to form a layer of the azo dyes. The gradual growth of the dye layers formed by the successive adsorption and coupling reaction of diazonium resin and aminonaphthol sulfonic acid compound was evaluated by UV-vis spectroscopy. The adsorption spectra of the self-assembled multi-layer is shown in Fig. 4. Fig. 4 shows that new adsorption shoulder peaks caused by diazo coupling reaction with coupling compound appeared at 570nm. From the results in Fig. 4, it can be proposed that the fabrication and diazo coupling reaction were successfully achieved because of the electrostatic attraction between positive charges on the diazonium resin and negative charges on the coupling compound and its corresponding phenol type coupling reaction.

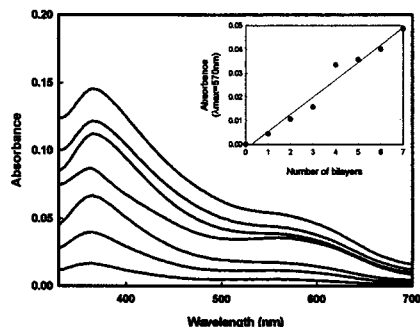


Fig. 4. UV-vis adsorption spectra of the diazonium resin/H-acid layers with diazo coupling reaction.

## 4. Conclusions

Multi-layer thin films consisting of diazonium resin and aminonaphthol sulfonic acid compound have been successfully prepared by electrostatic layer-by-layer self assembly method. The growth of multi-dye layer formed by the sequential adsorption and coupling reaction of the diazonium resin and coupling compounds was determined.

## Acknowledgement

This research was supported by the Program for the Training of Graduate Students in Regional Innovation which was conducted by the Ministry of Commerce Industry and Energy of the Korean Government.

## References

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