

國立交通大學

應用化學所

碩士論文

含硫與芳香環之高折射率環氧樹脂的合成與硬化後物  
性研究

Synthesis and Physical Properties of Sulfur and Aromatic  
Ring-Containing Epoxy Resins with High Refractive



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# Synthesis and Physical Properties of Sulfur and Aromatic Ring-Containing Epoxy Resins with High Refractive Index

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## Abstract



This research is focused on syntheses of three novel difunctional epoxies containing sulfur and benzene ring. :Epoxy { Diglycidyl ether of 4,4'-thiodiphenol }, Epoxy { Diglycidyl ether of 4,4'-thiobis(2-tert-butyl-5-methylphenol) }, Epoxy { Diglycidyl thioether of 4,4'-thiodibenzene-ethiol } . The properties of the epoxies which we synthesized were compared with that of commercially available 830LVP epoxy. These epoxies were further cured with two anhydrides and two thiols.

Optical properties including refractive index and ultraviolet/visible spectrum were characterized. Thermal properties of these epoxy resins were also studied by Thermogravimetric Analyzer (TGA), Differential

Scanning Calorimetry (DSC),and Thermal Mechanical Analyzer (TMA).

Experimental results showed that Epoxy / 4,4'-thiodibenzenethiol (CA ).Indicate the highest refractive index of 1.7328.Becase this system contains the highest percentage of sulfur and aromatic ring carbons. All samples showed good transparency of 80% to 90%.In addition TGA thermograms indicated good thermal stabilities for all these samples. The unset of 5% weight loss occurred at temperatures higher than 270 .



# 含硫與芳香環之高折射率環氧樹脂的合成與硬化後物性研究

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## 摘要



本研究合成三種不同含硫量的環氧樹脂：即Epoxy { Diglycidyl ether of 4,4'-thiodiphenol } , Epoxy { Diglycidyl ether of 4,4'-thiobis(2-tert-butyl-5-methylphenol) } , Epoxy { Diglycidyl thioether of 4,4'-thio-dibenzenethiol } , 並選用商品環氧樹脂830LVP做為比較組，分別與兩種酸酐及兩種硫醇硬化劑硬化，可得到12組材料，由這些材料探討含硫量以及含芳香環比例對於折射率的影響，並討論光穿透度，即測量以光波長為589nm光的折射率以及在可見光/紫外光區域的穿透性。

鑑定分析，以FT-IR研究其交聯行為，以動態DSC探討交聯動力學，以TGA，TMA，測量熱裂解以及熱機械性質。

Epoxy /4,4'-thiodibenzenethiol(CA )含硫量以及含芳香環的比

例皆為所有配方中較高的，擁有最高的折射率(1.7328)，本論文的所有系統在光波長為400nm以上的光穿透度皆可以達到80%至90%。TGA結果顯示，本論文配方系統中皆有良好的抗熱性，均因為含有雙苯環的結構，在5%的重量損失溫度都在270°C以上。



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