

# **2006 TAIWAN INTERNATIONAL SCIENCE FAIR**

**CATEGORY : Chemistry**

**PROJECT : Effects of Transition Metal Ions on the  
Thermal Stability, Fire Retardant Properties  
and Rheological Properties of  
Polymer-Organoclay Nanocomposites**

**AWARDS : Chemistry First Award**

**SCHOOL : Herricks High School**

**FINALISTS : Andrew Sangho Kim**

**COUNTRY : United States**

CATEGORY : Chemistry

TITLE : Effects of Transition Metal Ions on the Thermal Stability, Fire Retardant Properties and Rheological Properties of Polymer-Organoclay Nanocomposites

NAME : Andrew Sangho Kim

COUNTRY : U.S.A

A study was conducted to improve the thermal stability, fire retardant (FR) properties and rheological properties of ethylene vinyl acetate because of its growing use in commercial applications. The approach employed was to modify an organo-clay, Cloisite 20A (C20A), with transition metal ions (TMI). In this study eight transition metal salts were acquired for modification. It was observed that all TMI modified organoclay nanocomposites improved thermal stability through thermo-gravimetric analysis (TGA). Rheological testing was done using a parallel plate measuring system (PP MS) to determine the dependence of storage modulus and loss modulus of copper and iron modified organoclay nanocomposites relative to pure EVA 350. The process of gelation was also tested for by calculating the ratio between the loss modulus and the storage modulus. It was found that copper modified organoclay nanocomposites promoted gelation and thus decreased the fluidity of EVA 350. The intercalation of the TMI modified organoclays with the polymer matrix was determined by the use of small angle X-ray scattering (SAXS). Testing revealed that the intercalation was successful, further proving that the TMIs had improved thermal stability, FR properties and rheological properties,

## 評語

The study showed that transition metal ions , especially copper improve thermal stability, fire retardant properties and rheological properties of polymer-organoclay nanocomposites . Explanation of the difference between different transition metal ion would improve the quality of this work .