

## Temperature Coefficients of the Refractive Index for Ge Film

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**Abstract :** Ge film is widely used in infrared optical systems. Because of the special requirements of space application, it is usually used in low temperature. The refractive index of Ge film is always changed with the temperature which has a great effect on the manufacture of high precision infrared optical film. Specimens of Ge single film were deposited at ZnSe substrates by EB-PVD method. During temperature range 80K ~ 300K, the transmittance of Ge single film within 2 ~ 15  $\mu\text{m}$  were measured every 20K by PerkinElmer FTIR cryogenic testing system. By the full spectrum inversion method fitting, the relationship between refractive index and wavelength within 2 ~ 12 $\mu\text{m}$  at different temperatures was received. It can be seen the relationship consistent with the formula Cauchy, which can be fitted. Then the relationship between refractive index of the Ge film and temperature/wavelength was obtained by fitting method based on formula Cauchy. Finally, the designed value obtained by the formula and the measured spectrum were compared to verify the accuracy of the formula.

**Keywords :** infrared optical film, low temperature, thermal refractive coefficient, Ge film

**Conference Title :** ICPSE 2017 : International Conference on Plasma Surface Engineering

**Conference Location :** Paris, France

**Conference Dates :** August 28-29, 2017