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Temperature dependent terahertz properties of Ammonium Nitrate ABDUR RAHMAN, Edinboro University of Pennsylvania, ABUL AZAD, DAVID MOORE, Los Alamos National Laboratory — Terahertz spectroscopy has been demonstrated as an ideal nondestructive method for identifying hazardous materials such as explosives. Many common explosives exhibit distinct spectral signatures at terahertz range (0.1-6.0 THz) due to the excitations of their low frequency vibrational modes. Ammonium nitrate (AN), an easily accessible oxidizer often used in improvised explosive, exhibits strong temperature dependence. While the room temperature terahertz absorption spectrum of AN is featureless, it reveals distinct spectral features below 240 K due to the polymorphic phase transition. We employed terahertz time domain spectroscopy to measure the effective dielectric properties of AN embedded in polytetrafluoroethylene (PTFE) binder. The dielectric properties of pure AN were extracted using three different effective medium theories (EMT), simple effective medium approach, Maxwell-Garnett (MG) model, and Bruggeman (BR) model. In order to understand the effect of temperature on the dielectric properties, we varied the sample temperature from 5K to 300K. This study indicates presence of additional vibrational modes at low temperature. These results may greatly enhance the detectability of AN and facilitate more accurate theoretical modeling.

Abdur Rahman
Edinboro University of Pennsylvania

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