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ERE from Graphene Oxide in the ISM. A possible link to IOM?

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Dust particles play a major role in the formation, evolution and chemistry of interstellar clouds, stars, and planetary systems. Commonly identified forms include amorphous and crystalline carbon-rich particles and silicates. Also present in many astrophysical environments are polycyclic aromatic hydrocarbons (PAHs), detected through their infrared emission, and which are essentially small flakes of graphene. Astronomical observations over the past four decades have revealed a widespread unassigned 'extended red emission' (ERE) feature which is attributed to luminescence of dust grains. A luminescence feature with similar characteristics to ERE has been found in organic material in interplanetary dust particles and carbonaceous chondrites.

There is a strong similarity between laboratory optical emission spectra of graphene oxide (GO) and ERE, leading to this proposal that emission from GO nanoparticles is the origin of ERE and that heteroatom-containing PAH structures are a significant component of interstellar dust. The proposal is supported by infrared emission features detected by the *Infrared Space Observatory (ISO)* and the *Spitzer Space Telescope*.

Insoluble Organic Material (IOM) has a chemical structure with some similarities to graphene oxide. It is suggested this may contribute to the discussion as to whether IOM has an origin in the interstellar medium or the solar nebula, or some combination.