

# The Mysterious “30 $\mu$ m” Emission Feature of Evolved Stars: MgS or Graphite?

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A large number of carbon-rich evolved objects (asymptotic giant branch stars, protoplanetary nebulae, and planetary nebulae) in both the Milky Way galaxy and the Magellanic Clouds exhibit an enigmatic broad emission feature at  $\sim 30 \mu\text{m}$ . This feature, extending from  $\sim 24$  to  $\sim 45 \mu\text{m}$ , is very strong and accounts for up to  $\sim 30\%$  of the total infrared luminosity of the object. In literature it is tentatively attributed to magnesium sulfide (MgS) dust. Using the prototypical protoplanetary nebula around HD 56126 for illustrative purpose, however, in this work we show that in order for MgS to be responsible for the  $30 \mu\text{m}$  feature, one would require an amount of MgS mass substantially exceeding what would be available in this source. We therefore argue that MgS is unlikely the carrier of the  $30 \mu\text{m}$  feature seen in this source and in other sources as well. We further argue that graphite may be a promising candidate, as the free electrons in graphite seem to produce a strong resonance band at  $30 \mu\text{m}$ .