The PAH emission properties of an ensemble of UCHII regions in W49A

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The galactic star-forming region W49A is considered to be the Milky Way analogue of extragalactic starburst environments. W49A contains an ensemble of ultra compact HII (UCHII) regions along with copious diffuse material and young stars. Spitzer/IRS mapping observations of a 3'x2' subsection of W49A have been obtained in the 5-14 μm range. These observations cover approximately 20% of W49A and encompass many of the previously detected UCHII regions along with diffuse structure, all of which display the characteristic mid infrared PAH emission. The spectral properties of the emission at each pixel of the map have been analyzed, allowing the detailed comparison of the mid infrared emission of the different UCHII regions and surrounding material. The UCHII regions possess different properties in terms of their stellar populations (and hence the incident UV fields), ionization, extinction etc. resulting in different PAH emission characteristics. Nevertheless, we recover the well-known PAH intensity correlations albeit with indications that the simple relationships may become more complex in some regions. These results are compared to the characteristics of the diffuse PAH emission surrounding W49A, along with previous studies of PAHs in HII regions. Furthermore, we investigate the link between the PAH emission and the physical conditions of the HII regions (e.g. line ratio proxies for ionization). Finally, we show that the spatial structure of the various MIR emission components in these UCHII regions (e.g. the continuum emission, PAH bands and forbidden lines) can be simply modeled assuming emission from spherically symmetric shells. This model can recover the parameters of the emitting regions, e.g. the characteristic radii and thickness of the emitting shells. Using the model it is shown that the 8.6 μm PAH emission originates closer to the exciting stars than the other PAH bands. In addition, for one of the UCHII regions, we find that the 6.2 and 7.7 PAH bands no longer correlate on the lines of sight near the center, an effect noted previously in only one other object, also an HII region. It is also shown that the continuum emission and the plateaus supporting the 5-10 μm PAH features are spatially disconnected in these objects, in contrast to studies of reflection nebulae.