Interstellar dust Modelling from a New Vantage Point

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The evolution of amorphous hydrocarbon materials, a-C(:H), principally resulting from UV photon absorption-induced processing, are likely at the heart of the variations in the observed properties of dust in the interstellar medium. The key aspects of their evolution are the size-dependence of their properties and the compositional variations in a-C(:H), from aliphatic-rich a-C:H to aromatic-rich a-C. This will be presented within the context of the observed variations in interstellar dust extinction and emission. The optical properties of a wide range of a-C(:H) materials were recently derived (Jones, 2012, A&A, 540; A1, 540, A2 and 542, A98) and these, combined with that for an amorphous forsterite-type silicate with iron nano-particle inclusions, a-$\mathrm{Sil_{Fe}}$, are used to explore dust evolution in the interstellar medium.

A new dust model is presented (Jones *et al.* 2013, A&A, submitted), which consists of a power-law distribution of small a-C grains and log-normal distributions of large, a-SilFe and a-C(:H) grains. This dust model contains no 'interstellar' PAHs, astronomical silicate, graphite or any of the usual MRN-type power law dust size distributions. The model, which is firmly anchored by laboratory-data, is shown to quite naturally explain the variations in the IR-FUV extinction, the 217 nm UV bump, the IR absorption and emission bands and the IR-mm dust emission. The model is additionally able to explain efficient H_2 formation in photo-dominated regions (PDRs), even up to moderately high radiation field intensities where the dust is rather warm, $T_{\mathrm{dust}} > 25\,\mathrm{K}$ (Jones, Habart *et al.*, in preparation).

The major strengths of the new model are its inherent simplicity and built-in capacity to follow dust evolution in interstellar media. Further, it is shown that mantle accretion in the diffuse ISM and molecular clouds has many interesting consequences (Jones 2013, A&A, submitted) and that UV photo-processing in PDRs are likely the major drivers of dust evolution.