Photoprocessing-driven dust evolution in the diffuse ISM

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The different observed characteristics of dust in different phases of the interstellar medium (ISM) are often attributed to dust evolution under environment-dependent processes [1] [9]. Dust in dense filaments for instance has increased emissivity, which has been attributed to the formation of aggregates following grain collisions [9]. However, the recent discovery that enhanced emissivity is also observed in the diffuse ISM [8] is difficult to explain in the same way, because the lower density of the diffuse ISM makes these processes inefficient.
We show that using the hydrogenated amorphous carbon – a-C(:H) – recently proposed by Anthony Jones as a component in interstellar dust models [3] [4] [5] [6] [7] it is possible to explain this phenomenon while remaining consistent with constraints from both dust emission and extinction curves. Since a-C(:H) is dehydrogenated by FUV radiation and its optical properties depend on hydrogen content, this material's properties will depend on local conditions and the previous history of dust.
We calculated the emission and extinction curves for a modified Compiègne *et al*. model [2] that includes BGs and VSGs made of a-C(:H). Variations in the hydrogen content in this material change the emission and temperature of dust coherently with the observations while maintaining the extinction curve. We believe this shows the potential of a-C(:H) as a constituent in the next generation of dust models.

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