SMC : UV EXTINCTION CURVES, GAS TO COLOR-EXCESS RATIOS*

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We have made an extensive study of the far-UV extinction in SMC stars using IUE spectra mostly obtained by us. The studied stars are Sk 7, 13, 18, 32, 76, 82, 85, 103, 119, 124, 142, 143, 159, 191 and AV 398. A few other stars have also been observed but are unsuitable for extinction studies. We have obtained at ESO new photometry and spectral classifications for all the studied stars. The far-UV extinction curves derived from IUE spectra of matched star pairs are all similar, except for Sk 143 (Lequeux et al., 1982), Sk 124 and 191. The mean curve, which supersedes that of Rocca-Volmerange et al.(1981) is plotted Fig.1 with the label SMC "normal", as well as the curves for the three "anomalous" stars (full lines) For comparison, we also plot the LMC "normal" curve and that for the anomalous star Sk-69°108 (dotted-dashed curves), the "normal" galactic curve and the curves for two stars in Scorpius-Ophiuchus.

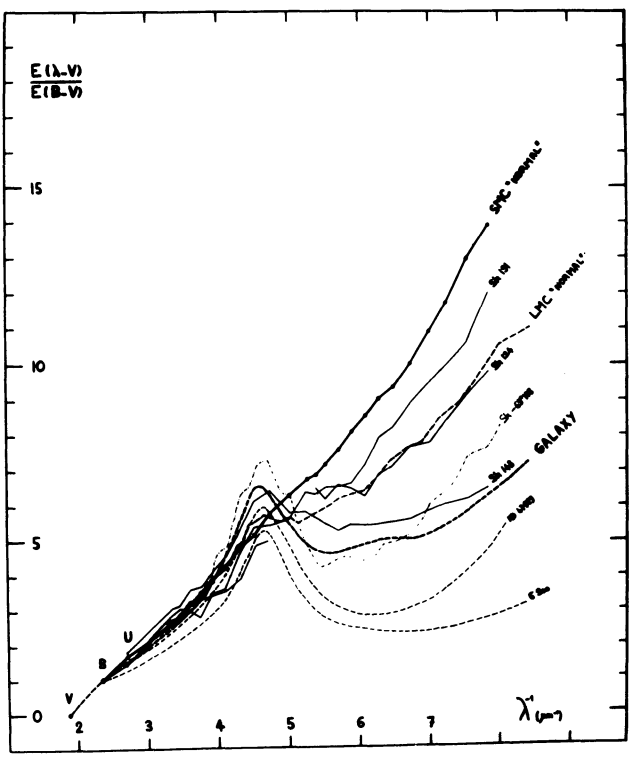

Fig. 1. UV extinction curves for SMC and other stars, normalized by E(B-V).

*Based on observations with the International Ultraviolet Explorer collected at the ESA Villafranca station, and at ESO, Chile.

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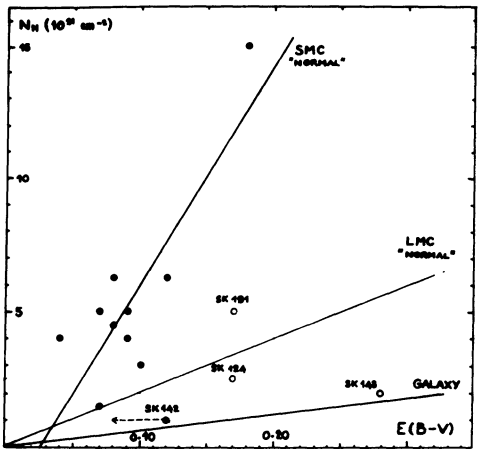

Fig. 2. Hydrogen column density vs. color excess for SMC stars (black dots). Three deviating stars are indicated by circles. The average errors are about 0.03 in color excess and 1.5 10^{21} in column density. The LMC and galactic mean relations are indicated for comparison.

Note the similar *relative* behaviour of the "anomalous" stars. In Fig.2 we plot the hydrogen column density N_H as derived from the interstellar Lyman α profile in the IUE spectra, vs. the color excess. Note that the three stars which deviate from the mean relation are *the same* that show an anomalous extinction curve. The intercept of the mean SMC relation on the E(B-V) axis gives approximately the galactic foreground color excess, about 0.03.

CONCLUSIONS : 1) The SMC, LMC and galactic "normal" UV extinction curves differ. The SMC curve is nearly linear in λ^{-1} and can be accounted for by silicate grains alone with a size distribution slightly steeper than the galactic one. The absence of graphite can be related to the large underabundance of carbon in the SMC.

2) The "normal" SMC $N_H/E(B-V)$ ratio is 10^{23} $cm^{-2}mag^{-1}$, 17 times the galactic value (the LMC one is 4 times galactic). If extinction is due to silicates, the ratio Si(in grains)/H is about 1/10 solar ; given the underabundance of the SMC in heavy elements, this is consistent with most of the Si being in grains.

3) Sk 143 and to a lesser extent Sk 124 and 191 show *both* UV extinction curves *and* $N_H/E(B-V)$ ratios closer to the galactic ones. A similar relative behaviour of UV extinction can be seen for Sk-69°108 in the LMC and for several Sco-Oph stars in the Galaxy. Graphite adds to the silicates. The $N_H/E(B-V)$ ratio for Sk 143 cannot be accounted for even if all Si and C in SMC abundances are in the grains. Either the extinction is circumstellar (but Sk 143 has little wind), or most of the hydrogen is molecular (but this does not explain the extinction curve), or the interstellar gas in front of Sk 143 has been enriched by recent star formation and not yet mixed with the general medium. A galactic extinction is excluded by our interstellar radial velocities.

REFERENCES

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