CHARACTERISATION OF SEVERAL ELECTRONIC STATES OF FeH.

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FeH is an open shell diatomic molecule which has been identified in the atmospheres of cool stars from the observation of its electronic spectrum. Analysis of the spectrum provides insight into the nature of bonding and the coupling of angular momenta. Due to the abundance of unpaired electrons, the states of FeH have high orbital and spin angular momenta. The rotational constants for the electronic states observed are in the region of 5 to 6 cm^{-1}. These factors result in complex, many-line spectra where branch structure is difficult to pick out.

Three main systems have previously been identified: in the near infrared[a]; the green[b,c]; and the blue[d] regions of the electromagnetic spectrum. The infrared system has been assigned to a $^4\Delta$ - $^4\Delta$ transition, where the lower $^4\Delta$ state is the ground state of FeH. More recently, lines in the blue system have been assigned as $g^6\Phi$ - $X^4\Delta$ and $g^6\Phi$ - $a^6\Delta$ transitions.

Rovibrational features in the green system have now been assigned to the $e^6\Pi$ - $a^6\Delta$ transition. Dispersed fluorescence studies have resulted in the identification of two further systems at around 600 and 630nm. Rotational lines in the 630nm sytem have also been observed by laser induced fluorescence and assigned to the $e^6\Pi$ - $c^6\Sigma$ transition. Work is currently underway to produce an analysis of both of these systems.

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[a] J. G. Phillips, S. P. Davis, B. Lindgren, and W. J. Balfour *Astrophys. J. Supp.* **65**, 721 (1987).
[b] P. K. Carroll, P. McCormack, and S. O'Connor, *Astrophys. J.* **208**, 903 (1976).
[c] David A. Fletcher, Robert T. Carter, John M. Brown, and Timothy C. Steimle *J. Chem. Phys.* **93**, 9192 (1990).
[d] Robert T. Carter and John M. Brown, *J. Chem. Phys.* **101**, 2699 (1994).