POLYCYCLIC AROMATIC HYDROCARBONS IN THE MURCHISON METEORITE. B. P. Basile, B. S. Middleditch, and J. Oró. Dept. Biochem. Biophys. Sci., Univ. Houston, Houston, TX 77004

More than 30 polycyclic aromatic hydrocarbons have been identified in solvent extracts of the Murchison meteorite by gas chromatography - mass spectrometry. Ten of these compounds have been previously identified by other investigators (1,2). Nine heterocyclic compounds have also been identified in this study, including two sulfur-containing, two nitrogen-containing and five oxygen-containing aromatic hydrocarbons. Structural isomers of several alkylated aromatic hydrocarbons, including methylpyrene and methylphenanthrene, were chromatographically separated, thus allowing calculation of the amount of alkyl substituted compounds in the solvent extracts. The ratio of odd-carbon number to even-carbon number was found to be approximately 0.1. The aromatic compounds identified in the Murchison meteorite are qualitatively and quantitatively similar to those formed by pyrolysis of methane (3) and isoprene (4). Based on the pyrolysis data and data from the analysis of the solvent extracts, a temperature of 1000°C is suggested for the formation of polycyclic aromatic hydrocarbons in the solar nebula or premeteoritic body. This value is within the range of temperatures at which chondrules were formed (1800-2000°K) (5,6), and those at which chemical and isotopic equilibria ceased (380-400°K) (7,8). It is also suggested that some of the heterocyclic compounds extracted from the Murchison meteorite were formed by interaction of many of the nitrogen, oxygen, or sulfur-containing aliphatics found in interstellar space with other simple organic compounds in the presence of the inorganic components of the meteorite.

1. Pering K. and Ponnamperuma C. (1971) Science, 173, p. 237-239.

2. Studier M. H., Hayatsu R. and Anders E. (1972) Geochim. Cosmochim. Acta 36, p. 189-215.

3. Oró J. and Han J. (1966) Science, 153, p. 1393-1395.

4. Oró J., Han J. and Zlatkis A. (1967) Anal. Chem., 39, p. 27-32.

5. Suess H. E. (1963) I: In Origin of the Solar System (Edited by Jastrow R. and Cameron A. G. W. ), pp. 143-146, Academic Press.

6. Wood J. A. (1963) II: In Origin of the Solar System (Edited by Jastrow R. and Cameron A. G. W. ), pp. 147-154, Academic Press.

7. Lancet M. A. (1972) Ph.D. thesis, University of Chicago.

8. Onuma N., Clayton R. N. and Mayeda T. K. (1972) Geochim. Cosmochim. Acta 36, p. 169-188.