

THE CHARACTERIZATION OF FOSSIL AND MODERN SPOROPOLLENINS USING  
13-C SOLID STATE NUCLEAR MAGNETIC RESONANCE

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Recent  $^{13}\text{C}$  solid state nuclear magnetic resonance studies have demonstrated differences in the composition of sporopollenins (the inert biomolecule forming spore and pollen walls) from the major groups of extant plants. This substance is also the main constituent of fossil spore walls.

We have obtained  $^{13}\text{C}$  NMR spectra from three species of Carboniferous lycopod megaspores, and in one case, the associated microspores. Additionally, spores from the Devonian plant *Parka decipiens* Fleming have been analyzed. The spectra obtained are relatively similar although at present it is unclear how much of this similarity results from diagenesis.

The spectra of the fossil spores have been compared to those obtained from extant lycopods and from other plant groups. The fossil lycopod spores share some of the distinctive features of modern lycopod sporopollenin but are, none the less, very different. The spectra of the fossil species also demonstrate the loss of constituents known to form a significant part of the sporopollenin in extant species. Our studies show that some of the chemical characteristics of sporopollenins are retained in fossil spores, allowing the investigation of evolutionary changes of sporopollenin within a group and facilitating the assignment of taxonomically enigmatic fossil species. Further investigation of a range of fossil material, combined with data obtained from pyrolysis, should provide further information on the composition of sporopollenin from different plant groups and on its diagenesis.