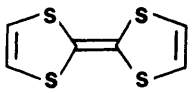
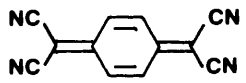
TTF and TCNQ

Components for conductivity

Tetrathiafulvalene (TTF) and several other tetrathioethylenes were originally investigated as possible electron-rich olefins.[1] It was quickly realized that the electrochemistry of **TTF** was by far the most interesting aspect of the compound. Wudl *et al.*[2,3] discovered that **TTF** formed an exceptionally stable radical cation complex with chlorine (TTF·Cl) which exhibited an unusually high electrical conductivity.



TTF

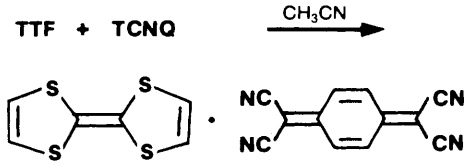


TCNQ

7,7,8,8-Tetracyanoquinodimethane (TCNQ) was first studied for its ability to form radical anions.[4,5,6] Since then, many practical applications have been discovered. For example, **TCNQ** is used in the:

1) colorimetric determination of free radical precursors[7]
2) visualization of certain nitrogen and sulfur compounds on thin-layer and paper chromatograms[7,8]
3) replacement of MnO_2 in aluminum solid electrolytic capacitors[9]
4) construction of heat-sensitive resistors[10]
5) induction of radical polymerizations (in combination with *N,N*-dimethylaniline *N*-oxide)[11]
6) construction of ion-specific electrodes.[12,13]

It was the ability of **TCNQ** to form radical anions that prompted Cowan[14] to combine it with the electron donor **TTF**. The resulting charge-transfer complex was found to contain **TTF** and **TCNQ** in a 1:1 ratio.



This complex behaves electrically and optically like a one-dimensional metal at room temperature. It has one of the highest electrical conductivities known for an organic compound, being highly anisotropic along an axis defined by the colinear stacks of **TTF** and **TCNQ**.[15] Since there was some controversy over the exact value of the conductivity, a study was performed to determine if the chemical purity of the components affected the electrical conductivity of the complex.[16] The workers concluded that crystal perfection rather than chemical purity was the factor chiefly responsible for determining the degree of conductivity. Major research efforts are currently in progress to better understand and find applications for the unusual properties of the **TTF/TCNQ** complex.[17,18,19]

Aldrich has offered **TCNQ** for many years. Now we also offer **TTF**! With the ready availability of these "components for conductivity," the **TTF/TCNQ** complex is more accessible for further studies.

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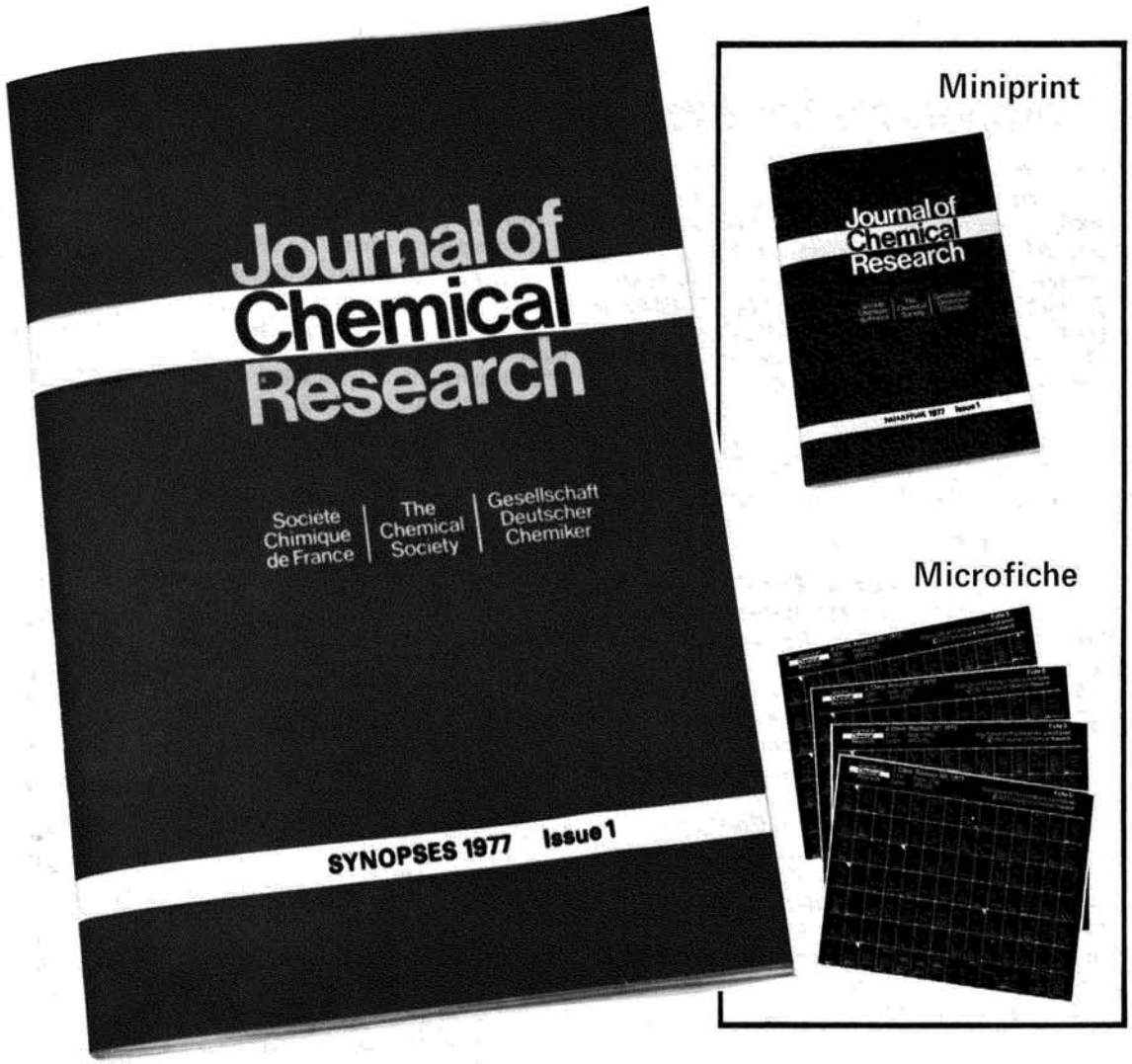

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