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- Wyerone acid. Structure of a fungal metabolite of the phytoalexin wyerone acid from *Vicia faba* L., 2557.

Y

Xanthenones. Friedel-Crafts acylation-cyclisation reactions of 3-bromophenyl ethers with phosphorus trichloride and oxalyl chloride to give the corresponding phenoxaphosphine and xanthen-9-one derivatives, 1972.

Xanthones. Studies in the xanthone series. Part XII, a general synthesis of polyoxygenated xanthones from benzophenone precursors, 1329.

X-Ray analysis of cis-1,4-dimethylisothiochroman 2,2-dioxide, an S-heterocycle with preferred boat conformation. Synthesis and conformation of substituted isothiochromans and derivatives, 410.

X-Rays. Chemical and X-ray studies of a [1,4]diazepino-[7,1-a]isoquinolin-2-one, a Schmidt reaction product from 3-ethyl-1,6,7,11b-tetrahydro-9,10-dimethoxy-4H-benzo-[a]quinolizin-2(3H)-one, 2830.

Ylides. Stereospecific formation of a vinyl sulphide via a sulphonium ylide—salt coupling reaction, 2016.

1,3,12,14-Tetramethyldibenzo[a,i]dithieno[3,4-e;3',4'-m]-cyclohexadecene. Reactions of the bis-ylide from 2,5-dimethylthiophen-3,4-diylbis(methylenetriphenylphosphonium chloride) with 2,5-dimethylthiophen-3,4-dicarbaldehyde and with o-phthalaldehyde, 1136.

 \mathbf{Z}

Zygosporins. Nomenclature of a class of biologically active mould metabolites: the cytochalasins, phomins, and zygosporins, 1146.