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The photooxygenation of tetrahydronaphthalene and its chemical transformation

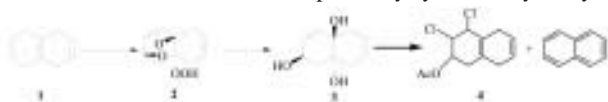
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Keywords: photooxygenation, tetrahydronaphthalene, crystal structure

1,4-epiperoxides(endoperoxides) serve as a key substances in a variety of chemical[1] and biological[1,2] transformations. The O–O bound undergoes either homolytic and heterolytic cleavage depending on reaction conditions. Tetraphenylporphyrin (TPP) sensitized photooxygenation of tetrahydronaphthalene in methylene chloride at room temperature resulted in the formation of the tricyclic compound **2**. The exact configuration of **2** was determined by X-ray crystal analysis of endoperoxide. Selective reductive of both peroxide linkages in **2** was performed with either thiourea or LiAlH_4 under very mild conditions to give 1,2,5,8-Tetrahydro-naphthalene-2,4a,8a-triol **3**. The acetylation of triol **3** with acetyl chloride afforded unusual rearrangement product **4** which is mono acetylated and naphthalene in ratio of 80:20 that is determined by ^1H NMR spectrum of the reaction mixture. Although all NMR spectral data support the proposed structure, to gain more insight about the crystal structure of the compound **3**, we decided to confirm its exact structure by single-crystal X-ray diffraction techniques.

In this study, we synthesized successfully cyclohexa-annulated molecule with a practical and useful method. Moreover, we characterized our final molecule precisely by the X-ray analysis.



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m46.p01

Tensor distinction of pairs of completely transposable domain states in multiferroics

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Keywords: tensor distinction, domain states, ferroics

Consideration of tensor properties of domain states is based on the theory of group representations. Character theory has been used to find which tensors distinguish pairs of domain states. This theory, however, enables us to find only the type of tensors and the number of independent components in which the states differ. Methods of tensor calculus were developed [1] and recently extended to magnetic groups and properties [2] which facilitate the search of explicit tensor components in which the domain states differ. The knowledge of explicit components is of special importance in domain engineering, especially in consideration of multiferroics. It can be also used in cases when the symmetry of ferroic state is uncertain. Such cases are not quite unusual [3]. Another example from the field of multiferroics is represented by the case of ferromagnetic/ferroelectric rare earth hexagonal manganites where neutron scattering experiments are compatible with two spin arrangements of distinct point symmetries [4]. To find the right structure, experiments on second harmonic generation were used. The pairs of domain states are completely transposable in this case as in all cases of transitions in the lattice of subgroups from the magnetic point group $6/mmm\ 1'$ to 3 as well as in the lattice from $4/mmm.1'$ to 112 or from $m3m\ 1'$ to $m3$. In these particular cases, the search for explicit tensor components is exceedingly easy and can be used to find the most suitable tensors as candidates by which the symmetry of ferroic phase can be specified as well as for the exact distinction of pairs of domain states

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