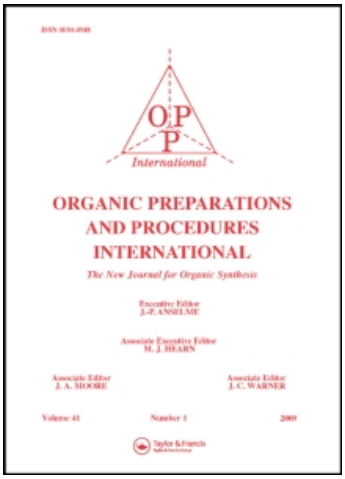

Organic Preparations and Procedures International
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t902189982

STUDY IN CROSSOVER FRIES MIGRATION

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To cite this Article Khanna, R. N. , Singh, K. P. and Sharma, Jyotsana(1992) 'STUDY IN CROSSOVER FRIES MIGRATION', Organic Preparations and Procedures International, 24: 6, 687 — 690
To link to this Article: DOI: 10.1080/00304949209356248
URL: http://dx.doi.org/10.1080/00304949209356248

crystal X-ray analysis determined the absolute configuration to be *cis*-(1R,2S).

Acknowledgement.- We thank Dr. Jon Bordner of Pfizer Central Research for the X-ray crystal structure analysis of the title compound salt.

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4. Lithium aluminum hydride has also been used with equal success.

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STUDY IN CROSSOVER FRIES MIGRATION

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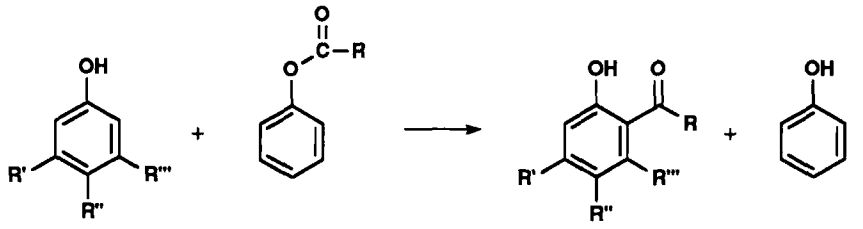
The Fries rearrangement may proceed *via* an intramolecular,[1] intermolecular[2] or partially inter- and intramolecular mechanism.[3] Crossover experiments support multiple mechanistic pathways.[4] The acetyl group migrates to *ortho* and *para* positions, while the benzoyl group moves predominantly to the *para* position.[5] It is difficult to prepare 2-benzoyl-1-napthanol[6] and 2-acetyl- and 2-benzoyl-1,5-dihydroxynapthalene. The present communication describes suitable conditions which give crossover products, exclusively. We have successfully synthesized 2-benzoyl-1-napthanol- and 2-acetyl-1,5-dihydroxynaphthalene in less time and good yields. Aromatic esters such as phenyl benzoate do not undergo rearrangements with BF_3•etherate; however, when an active phenolic compound such as phenol, hydroquinone, resorcinol, phloroglucinol, 1-naphthol, 2-naphthol and 1,5-dihydroxynaphthalene is added, the acetyl or benzoyl group migrates from the corresponding esters to the more active aromatic *ortho* position of the phenolic compound to give the corresponding crossover products.



1

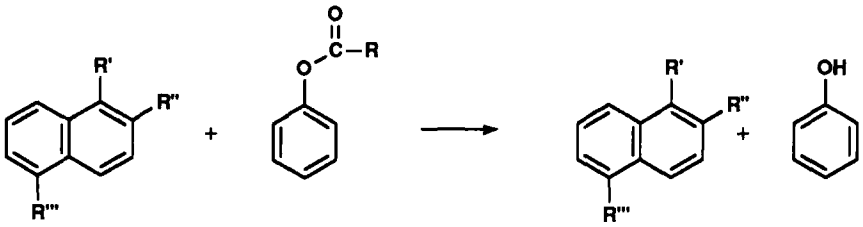
a) R' = R'' = R''' = H
b) R' = R''' = H, R'' = OH
c) R'' = R''' = H, R' = OH
d) R'' = H, R' = R''' = OH

2

a) R = CH_3
b) R = Ph

3

a) R' = R'' = R''' = H; R = CH_3 (70%)
b) R' = R''' = R'' = H; R = Ph (68%)
c) R' = R''' = H, R'' = OH; R = CH_3 (65%)
d) R' = R''' = H, R'' = OH; R = Ph (60%)
e) R'' = R''' = H, R' = OH; R = CH_3 (60%)
f) R'' = R''' = H, R' = OH; R = Ph (40%)
g) R'' = H, R' = R''' = OH; R = CH_3 (30%)
h) R'' = H, R' = R''' = OH; R = Ph (25%)



4

a) R'' = R''' = H, R' = OH
b) R' = R''' = H, R'' = OH
c) R'' = H, R' = R''' = OH

2

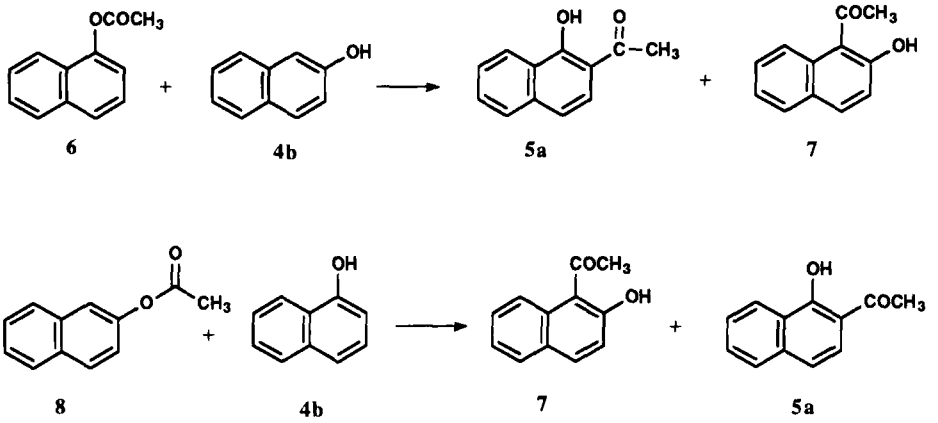
a) R = CH_3
b) R = Ph

5

a) R' = OH, R'' = $COCH_3$, R''' = H (55%)
b) R' = OH, R'' = COPh, R''' = H (50%)
c) R' = OH, R''' = H, R'' = $COCH_3$ (50%)
d) R'' = OH, R''' = H, R' = COPh (45%)
e) R' = R''' = H, R'' = $COCH_3$ (66%)
f) R' = R''' = OH, R'' = COPh (60%)

The reaction does not proceed with esters of aliphatic acids or when BF_3•etherate is replaced by other common Lewis acid catalysts. When the crossover experiments are carried out between 1-naphthyl acetate (**6**) and 2-naphthol or between 2-naphthyl acetate (**8**) and 1-naphthol, both intramolecular and intermolecular rearranged products, *i. e.* (**5a**) and (**7**), are obtained, but the predominant product is the intermolecular rearranged one because both 1- and 2-naphthols have active *ortho* positions.

However, when the reaction is carried out in the presence of a phenol with esters of a more active phenols, *e. g.* 2-naphthyl or 1-naphthyl acetate, only intramolecular rearranged products are formed. This may be explained because the 1- or 2-naphthyl radical or ion intermediate is more reactive than the phenyl radical or ion. Thus, the crossover experiments may be synthetically useful when a compound cannot be easily acetylated or benzoylated. The yields of the crossover products are good compared to the products obtained by Fries migration.



EXPERIMENTAL SECTION

Mps. are uncorrected. IR spectra were recorded on a Shizmadzu IR 435 spectrometer (Nujol cm^{-1}). PMR spectra were recorded on a Perkin Elmer R-32 (90 MHz) spectrometer using TMS as internal standard.

General Procedure.- To a solution of 0.1 mol of the substrate (**1a-d, 4a-c**) in sodium-dried benzene (20 mL), were added the ester (0.3 mol) and BF_3•etherate (8-10 drops). The solution was refluxed for 3 hrs and filtered; the solvent evaporated on a rotary evaporator. The residue was chromatographed on silica gel. The products were eluted with petroleum ether and subsequently with increasing percentages of benzene. Further purification of the products was carried out by preparative TLC using benzene as solvent. The products (**3h, 5e, 5f**) were identified by their respective spectral data. **5e** (Mp. 270°), IR (Nujol): 1300, 1360, 1400, 1480, 1560, 1595, 1615, 1755, 3300 cm^{-1}. ^1H NMR ($CDCl_3$): δ 13.8 (s, 1H, OH), 8.1 (d, J = 8 Hz, 1H, C_8-H), 7.9 (d, J = 8 Hz, 1H, C_4-H), 7.2-7.5 (m, 3H, $C_{3,6,7}$ H's), 2.7 (s, 3H, $COC\underline{H}_3$). **3h** (mp. 165°), IR (Nujol): 1390, 1460, 1690, 3400, 3600 cm^{-1}. ^1H NMR ($CDCl_3$): δ 11.8 (s, 1H, chelated OH), 8.3 (s, 2H, $C_{3,5}$ H's), 7.0-7.4 (m, 5H, C_6H_5). **5f** (mp. 167°), IR (Nujol): 1260, 1380, 1460, 1700, 2900 cm^{-1}. ^1H NMR ($CDCl_3$): δ 10.4 (bs, 1H, OH), 8.2 (mixed d, J = 8 Hz, 2H, $C_{3,8}$-H's), 7.5 (m, 3H, $C_{4,6,7}$-H's), 7.2 (m, 5H, C_6H_5). The known products were also compared with the authentic samples.[7]

Acknowledgements.- One of the authors (KPS) is grateful to the UGC for the award of a research fellowship.

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AN IMPROVED SYNTHESIS OF 2,4-DIMETHOXYPHENYLACETIC ACID

Submitted by (05/08/92)

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Our need for 2,4-dimethoxyphenylacetic acid (2,4-DMPA, **3**) revealed the absence of a convenient preparation and spectroscopic data for this compound in the literature. Indeed, the procedure of Snook[1] always gave **3** in yields ranging from trace amounts to 20% and when the reaction was repeated following Buess' conditions[1e] a mixture of 2,4- and 2,6-DMPA was obtained. An attempt to prepare the title compound following the Prevost conditions[2] by treatment of 2,4-dimethoxyacetophenone (**1**) with iodine and silver nitrate in refluxing methanol gave an 80% yield of 2,4-dimethoxy-5-iodoacetophenone. The Kindler modification of the Willgerodt reaction[3] afforded a mixture of 2,5-*bis*-(2,4-dimethoxyphenyl)thiophene (56% yield) and 2,4-DMPA (30% yield). We now describe the