

ORGANIC CHEMISTRY 2 LECTURE GUIDE 2019

BY RHETT C. SMITH, PH.D.

Marketed by Proton Guru

Find additional online resources and guides at protonguru.com.

There is a lot of online video content to accompany this book at the Proton Guru YouTube Channel! Just go to YouTube and search “Proton Guru Channel” to easily find our content.

Correlating these reactions with your course: The homepage at protonguru.com provides citations to popular text books for further reading on each reaction in this book, so that you can follow along using this book in any course using one of these texts.

Instructors: Free PowerPoint lecture slides to accompany this text can be obtained by emailing IQ@protonguru.com from your accredited institution email account. The homepage at protonguru.com provides a link to citations to popular text books for further reading on each Lesson topic in this primer.

© 2006-2019

Executive Editor: Rhett C. Smith, Ph.D. You can reach him through our office at:

IQ@protonguru.com

All rights reserved. No part of this book may be reproduced or distributed, in any form or by any means, without permission in writing from the Executive Editor. This includes but is not limited to storage or broadcast for online or distance learning courses.

Cover photo courtesy of William C. Dennis, Jr.

Printed in the United States of America

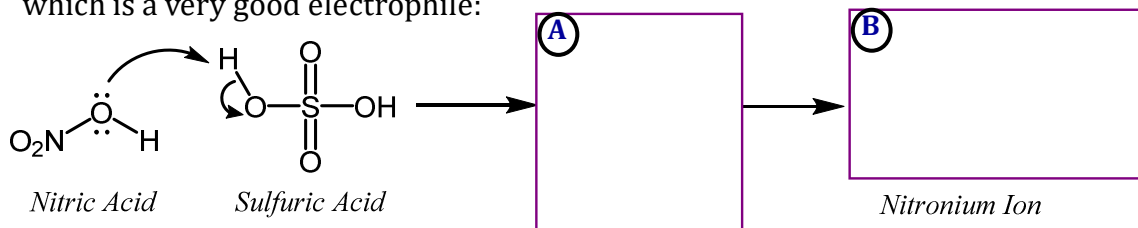
10 9 8 7 6 5 4 3 2 1

ISBN 978-0578415017 (IQ-Proton Guru)

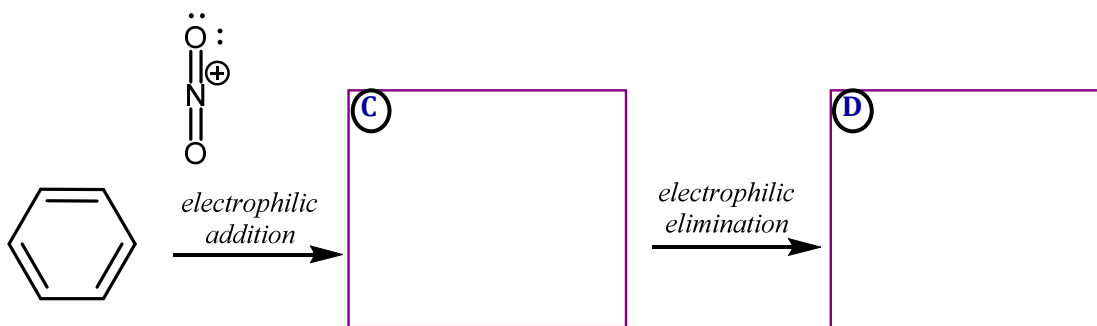
Lesson IV.8. EAS II: Nitration and Sulfonation of Benzene

Nitration

Sulfuric acid can dehydrate nitric acid to generate a nitronium ion (NO_2^+), which is a very good electrophile:



Once generated, the nitronium ion undergoes the usual EAS process with benzene. This is called a **nitration reaction**:

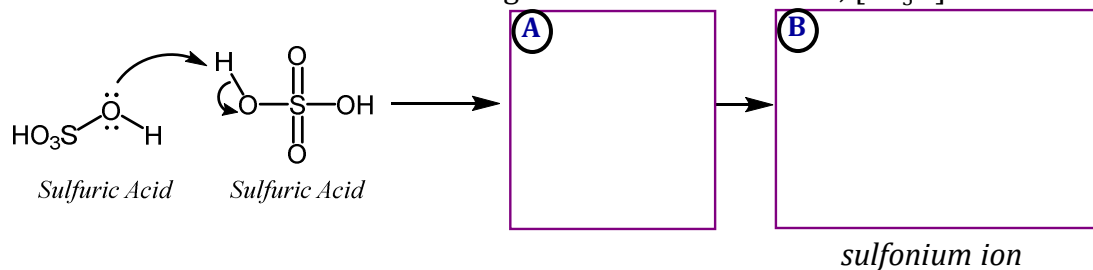


Notes

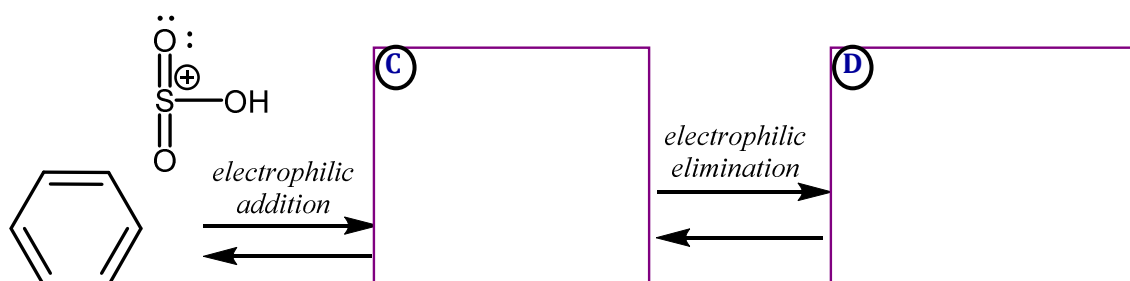
Lesson IV.8. EAS II: Nitration and Sulfonation of Benzene

Sulfonation

Sulfuric acid can react with itself to generate a sulfonium ion, $[\text{SO}_3\text{H}]^+$.



Once generated, the sulfonium ion undergoes the usual EAS process with benzene. This is called a **sulfonation reaction**:

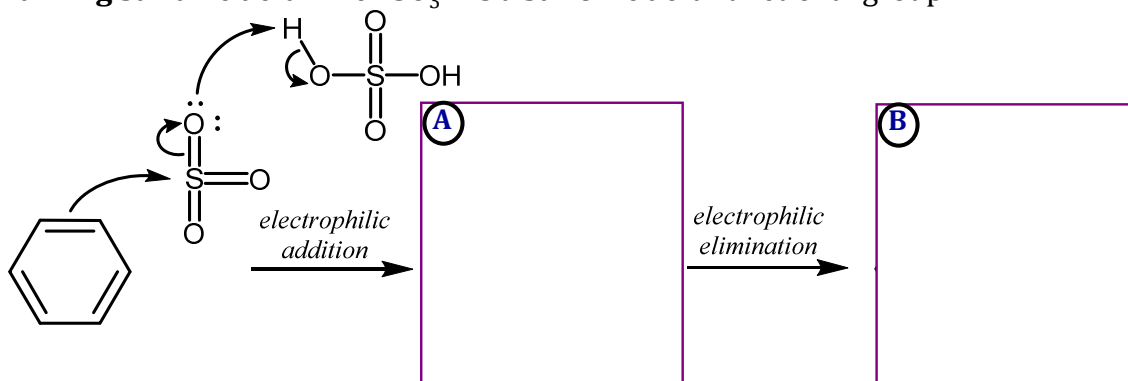


Notes

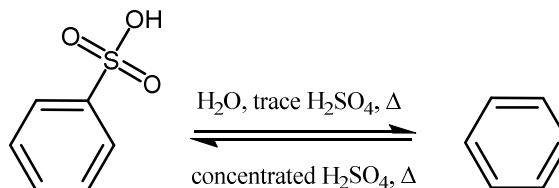
Lesson IV.8. EAS II: Nitration and Sulfonation of Benzene

Fuming sulfuric acid

Sulfur trioxide in sulfuric acid can also be used as the electrophile in a sulfonation reaction. A mixture of SO_3 in sulfuric acid fumes and so it is called **fuming sulfuric acid**. The $-\text{SO}_3\text{H}$ is a **sulfonic acid** functional group.



Sulfonation is reversible, so the sulfonic acid group can be removed by heating in water with catalytic acid:



Notes