MinistryofHealthoftheRussianFederation
Volgograd State Medical University

DepartmentofPharmaceuticalandToxicological Chemistry

GENERAL PHARMACEUTICAL CHEMISTRY

# CHEMICAL METHODS OF PHARMACOPOEIAL ANALYSIS - IDENTIFICATION OF DRUGS OF ORGANIC NATURE (IDENTIFICATION OF FUNCTIONAL GROUPS) (Identification of the primary aromatic group. Identification of the aromatic nitro group)

Lesson 4

V term

Volgograd,2022

Medicinal products of organic origin constitute the majority of medicinal products. The analysis of these pharmaceutical substances is mainly confined to the examination of the functional groups that make up the compound.

**A functional group** is a reactive atom or group of atoms that determines the chemical properties of a substance, its pharmacological activity and its belonging to a certain class of organic compounds.

The analysis of drugs by functional groups make sit possible

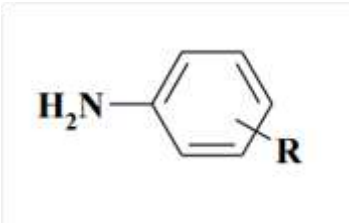
- to unify the methods of identification and quantification reactions;
- to predict test methods according to their structure.

Medicinal substances are usually polyfunctional compounds, i.e. they contain several functional groups.

In the identification, reactions are usually conducted for all functional groups, which makes it possible to correctly identify the drug substance.

For each functional group several methods of quantification are proposed, which makes it possible to select the optimal method of analysis in the study of medicinal substances in different objects (substance, medicinal product).

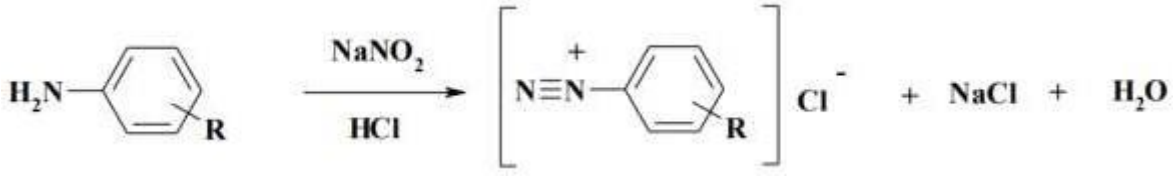
## Identification of primary aromatic aminogroup




### 1. Azodyeformation

**Azo dyes** are coloured (red, brown and orange) products produced in two stages:

1) Diazotization(productionofadiazoniumsalt):



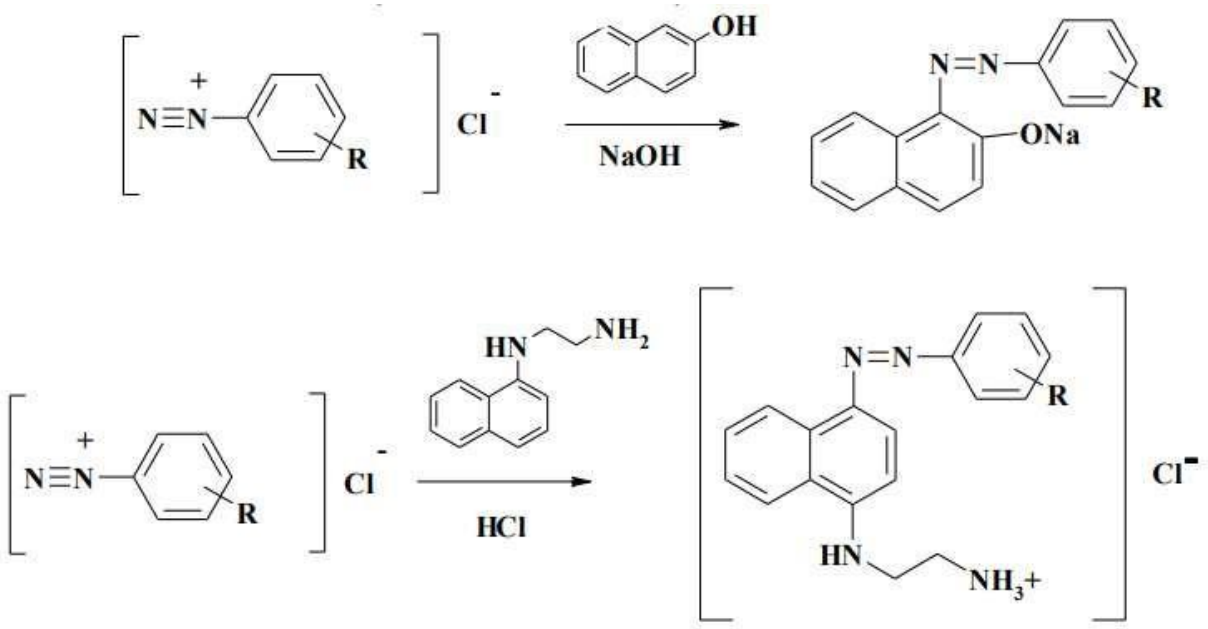
*Positive charge on this nitrogen atom and negative charge on chlorine*

2) Azo coupling (interaction of a diazonium salt with a phenol or aromatic amine).

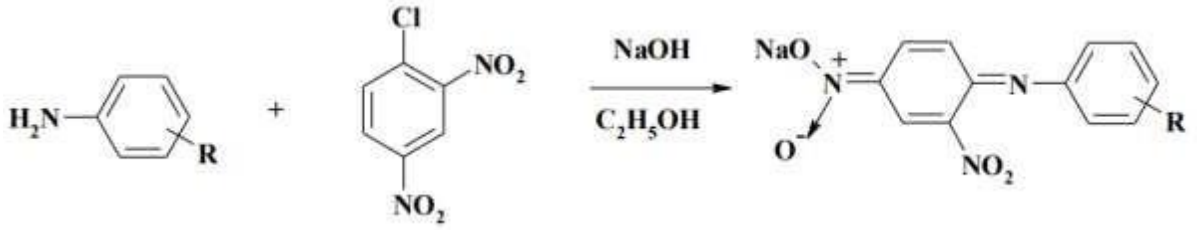
The reaction takes place in the ortho- or para-position with respect to the hydroxyl or amino group, but goes more easily to the para-position.

Azo coupling with phenols (naphthols) takes place in a slightly alkaline (pH 9.0-10.0) solution, and with amines in a slightly acidic solution.

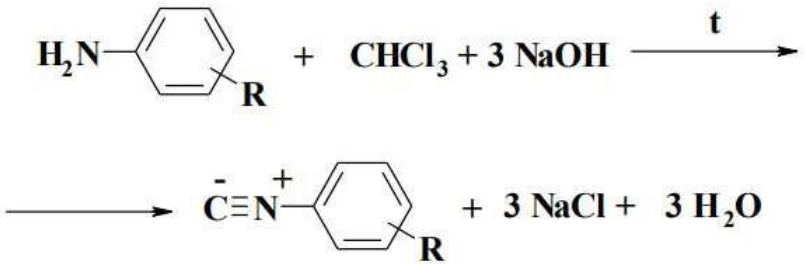
In practice, β-naphthol (in an alkaline solution) or α-naphthylethylenediamine (in an acidic solution) are the most commonly used components for azo coupling:




**2. Interaction with 2,4-dinitrochlorobenzene.** A sodium acisol dinitrophenyl derivative (yellow) is formed.

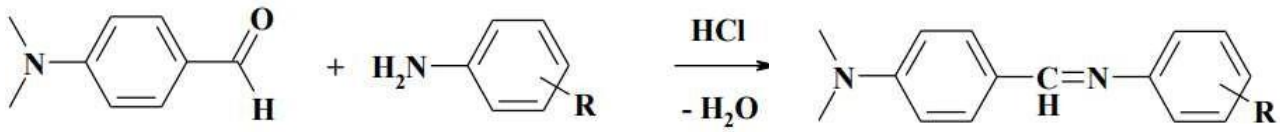


**3. Isonitrile test.** The reaction consists of the interaction of a primary aromatic amine with chloroform in an alkaline medium under heating. The resulting isonitriles are detected by the characteristic nauseating smell.

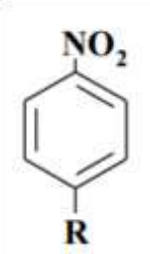



**4. Condensation reaction with aromatic aldehydes (formation of Schiff bases)**. The reaction products of primary amines with 4-dimethylaminobenzaldehydeorvanillininhydrochloricacidsolutionare usually colored yellow-orange.

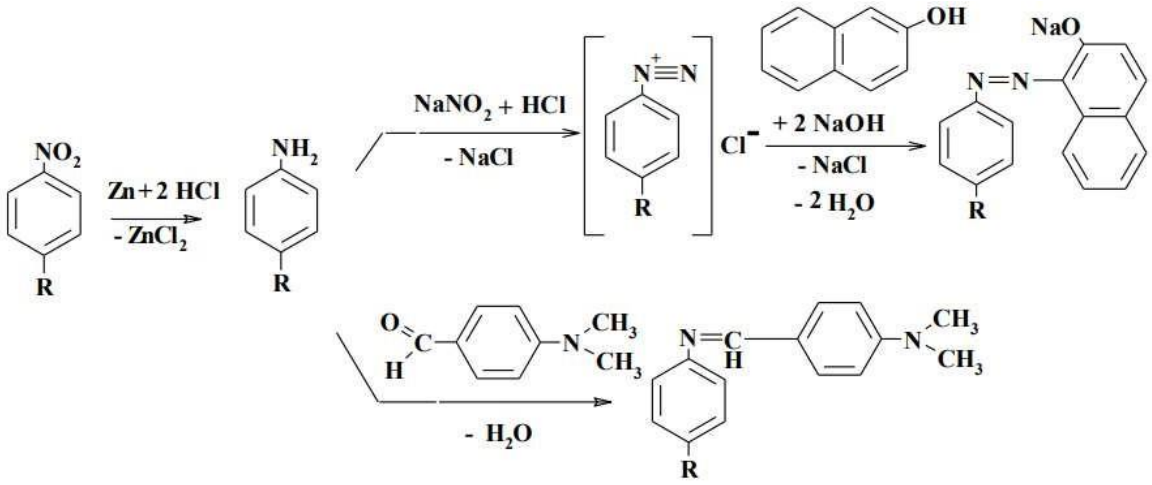
In express analysis this reaction is carried out in a drop version (lignin test, Ovchinnikov reaction).



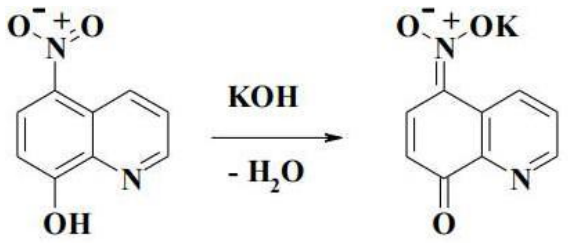

## Identification of aromatic nitrogroup




**1. Reduction reaction of an aromatic nitro group to a primary aromatic amino group (followed by determination).** Reagent - metallic zinc in an acidic medium when heated. The formation of the primary aromatic amine is proved by the reaction of the formation of the azo dye or Schiff bases.




**2. The acisol formation reaction.** Conducted for aromatic compounds containing a group with a mobile hydrogen atom (OH, $NH_2$, $CH_2$, CH)in ortho- or para-position relative to the nitro group. When alkalis are acted upon, potassium or sodium acisols are formed, which have respectively an ortho- or para-quinoid structure and are coloured bright yellow, orange or red.




nitroxoline acisol nitroxoline (orange-red colouring)