

# Chemical Resistance of Carbon & Graphite

Chemical properties:

Carbon is insoluble and has no liquid state. It can be rated among the materials of highest resistance to chemical attack.

[Organic chemistry](#)

[Inorganic chemistry](#)

[Chemical resistance of Carbon Materials, Hard Carbon and Graphite](#)



# Organic chemistry

Carbon is resistant to nearly all organic media. In this class are included the intermediate and final products of the following industries:

- petrochemistry
- coal purification
- synthetics
- paint
- dyes
- medical supplies
- cosmetics
- foodstuffs
- photographic chemicals
- refrigerants
- anti-freezing agents.



# Inorganic chemistry

Carbon is also resistant to most inorganic media, e.g. most acids and bases, all aqueous salt solutions and most industrial gases.



# Materials recommendations and chemical resistance

In practical application carbon often is impregnated. The impregnation agent, too, has its influence on chemical resistance.

In the table "[Carbon Materials](#)" carbon materials are recommended with and without impregnation. The data concerning chemical resistance of resin-impregnated carbon material can be interpreted as applicable, too, for a resin-bonded carbon grade. But contrary to a resin-impregnated material a resin-bonded one may rather be unsuitable for the function in view, as any chemical influence on the binder may result in a lower strength of the carbon. The table shows a large number of organic and inorganic media as examples for the wide range of the chemical resistance of our carbon materials. The structure formulas used are those of the "Handbook for chemists and physicists" by D'Ans-Lax. For a number of media no chemical formulas are mentioned:

- 1 . Media, chemically to be described as a mixture e.g. fruit juices, beer, milk, oil, petroleum etc. These mixtures are marked a).
2. Compounds of cyclic or complex structures, marked b).



# Materials recommendations and chemical resistance

There are some strongly oxidising inorganic media (acids, bases, halogenes) to which carbon is not resistant, or only resistant up to certain temperatures and concentrations. Carbon is not resistant to liquid alkalis (e.g. sodium or potassium) which form intercalation compounds with the carbon. During this process the volume of the part increases and thus destroys it as a mechanical component. The table “[Hard Carbon](#) and [Graphite](#)” shows media with limit-temperatures and limit-concentrations to which carbon is not or only resistant up to the statical test conditions with the values mentioned. These indications are valid only for one defined chemical combination. Because of the multitude of possibilities, mixtures of media have not been taken into consideration, although some general rules are mentioned. Resistance to mixtures of acids depends on the temperature and the resistance of the carbon to the concentration of the individual parts. The exceptions to this rule are fixed acid mixtures like mixed acid (sulphuric acid: nitric acid = 3:2) and aqua regia (hydrochloric acid = nitric acid 3:1). Resistance to acidified aqueous salt solutions depends on the temperature and concentration of the free acid: e.g. the sulphuric acid content in a copper sulphate solution or the nitric acid content in a cobaltous nitrate solution.

