

# Nickel oxide hydroxide

**Nickel oxide hydroxide** is the inorganic compound with the chemical formula NiO(OH). It is a black solid that is insoluble in all solvents but attacked by base and acid. It is a component of the nickel-metal hydride battery.

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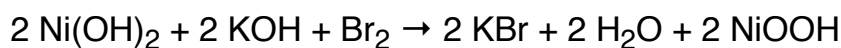
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## Related materials

Nickel(III) oxides are often poorly characterized and are assumed to be nonstoichiometric compounds. Nickel(III) oxide (Ni<sub>2</sub>O<sub>3</sub>) has not been verified crystallographically. For applications in organic chemistry, nickel oxides or peroxides are generated in situ and lack crystallographic characterization. For example, "nickel peroxide" (CAS# 12035-36-8) is also closely related to or even identical with NiO(OH).<sup>[1]</sup>

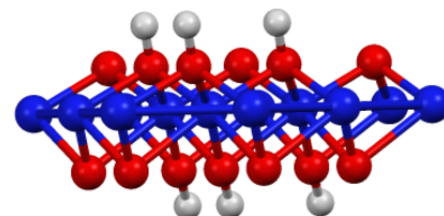
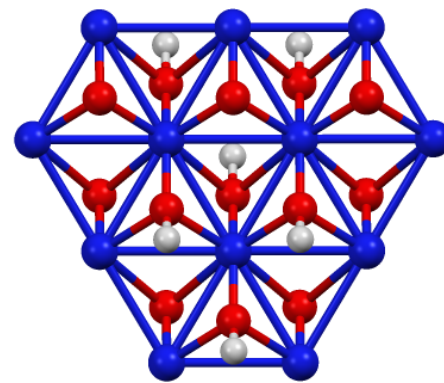
## Synthesis and structure

Its layered structure resembles that of the brucite polymorph of nickel(II) hydroxide, but with half as many hydrogens. The oxidation state of nickel is 3+.<sup>[2]</sup> It can be prepared by the reaction of nickel(II) nitrate with aqueous potassium hydroxide and bromine as the oxidant:<sup>[3]</sup>



## Use in organic chemistry

### Nickel oxide hydroxide



#### Names

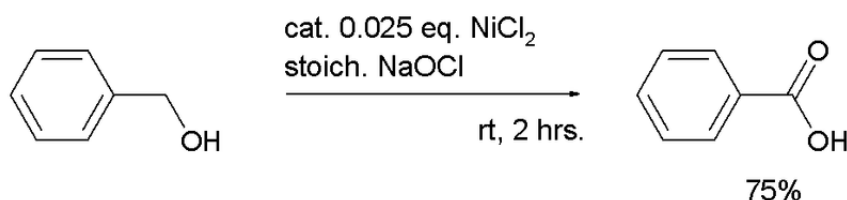
Other names

Nickel Oxyhydroxide

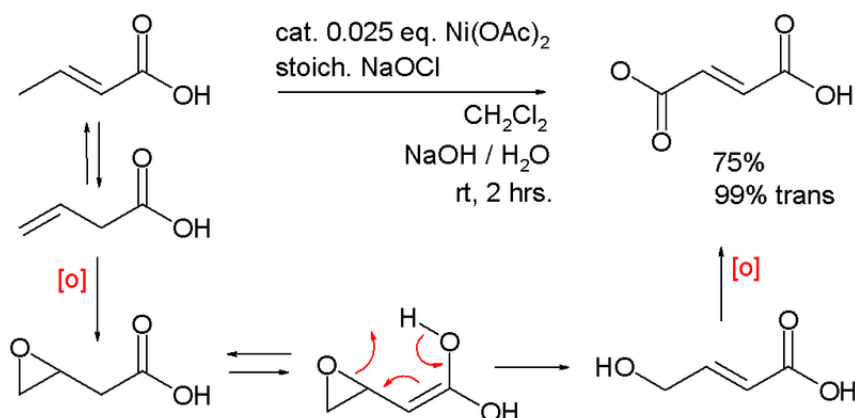
#### Identifiers

CAS Number	12026-04-9 ( <a href="http://www.commonchemistry.org/ChemicalDetail.aspx?ref=12026-04-9">http://www.commonchemistry.org/ChemicalDetail.aspx?ref=12026-04-9</a> ) <sup>✓</sup>
3D model (JSmol)	Interactive image ( <a href="https://chemapps.stolaf.edu/jmol/jmol.php?model=O%5BNi%5D%3DO">https://chemapps.stolaf.edu/jmol/jmol.php?model=O%5BNi%5D%3DO</a> )
PubChem CID	16684208 ( <a href="https://pubchem.ncbi.nlm.nih.gov/compound/16684208">https://pubchem.ncbi.nlm.nih.gov/compound/16684208</a> )

Nickel(III) oxides catalyze the oxidation of benzyl alcohol to benzoic acid using bleach:<sup>[4]</sup>



Similarly it catalyzes the double oxidation of 3-butenoic acid to fumaric acid:



InChI	
SMILES	
Properties	
Chemical formula	Ni(O)(OH)
Molar mass	91.699 g/mol
Appearance	black solid
Melting point	230 °C (446 °F; 503 K)
Except where otherwise noted, data are given for materials in their standard state (at 25 °C [77 °F], 100 kPa).	
Infobox references	

## References

- Gary W. Morrow "Nickel(II) Peroxide" Encyclopedia of Reagents for Organic Synthesis, 2001 John Wiley & Sons. doi:10.1002/047084289X.rn017 (<https://doi.org/10.1002%2F047084289X.rn017>)
- Casas-Cabanas, M.; Canales-Vazquez, J.; Rodriguez Carvajal, J.; Palacin, M.R. "Characterizing nickel battery materials: crystal structure of beta-(NiOOH)" Materials Research Society Symposia Proceedings (2009) 1126, p131-p136.
- O. Glemser "β-Nickel(III) Hydroxide" in Handbook of Preparative Inorganic Chemistry, 2nd Ed. Edited by G. Brauer, Academic Press, 1963, NY. Vol. 1. p. 1549.
- An Efficient and Practical System for the Catalytic Oxidation of Alcohols, Aldehydes, and , - Unsaturated Carboxylic Acids* Joseph M. Grill, James W. Ogle, and Stephen A. Miller *J. Org. Chem.*; **2006**; 71(25) pp 9291 - 9296; (Article) doi:10.1021/jo0612574 (<https://doi.org/10.1021%2Fjo0612574>)

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