

Nunchuck's fluidic path chemical compatibility

Introduction

This tech note provides information on the composition and chemical compatibility of the Nunchuck fluidic path materials including Nun, dispensing needles, tubing, and collection vials. **Table 1** lists the materials in Nunchuck's fluidic path. This compatibility is important in considering the potential use of the Nunchuck in several applications, including lipid nanoparticles, nanoparticles, liposomes, micelles, and nanoemulsions. The compatibility of the microfluidic chip is based on the effect a chemical may have on the swelling and dissolution of the PDMS-bonded glass. Please refer to **Table 2** for the reagents compatible with Nunchuck consumables.

In general, solvents with low solubility ($\delta \geq 9.9$ cal^{1/2} cm^{-3/2}) and moderate to high polar ($\mu > 1.4$ D) contributions are compatible with the Nun. Stainless steel and polypropylene are generally high in chemical resistance but should not be used in contact with halogenated and aromatic hydrocarbons or strong oxidizing acids.

On the other hand, high-solubility solvents which tend to be nonpolar or only slightly polar ($\mu \leq 1$ D)



Figure 1: Nunchuck is the one-and-done LNP maker.

are incompatible with the Nun. PDMS will absorb these solvents from a microchannel, and get saturated with the solvent over time. **Table 3** shows the reagents which are not compatible with the Nunchuck consumables. We do not support the use of these chemicals on the Nunchuck. Be advised that this is not an exhaustive list and if you would like to use chemicals that are not explicitly listed in **Table 2**, contact Unchained Labs before proceeding.

| Consumable Component | Material Composition |
|----------------------|---|
| Dispensing needles | 304 Stainless Steel and Polypropylene Plastic |
| Teflon tubing | PTFE |
| Chip | PDMS bonded to Soda Lime Glass |

Table 1: Consumable materials used in Nunchuck.

| Chemical | Maximum Concentration/Composition |
|---|---|
| Acidic /Aqueous (pH<7) | <ul style="list-style-type: none"> • 8% Acetic acid (vinegar) • 10% Nitric Acid |
| Basic/Aqueous (PH>7) | <ul style="list-style-type: none"> • 20% Ammonium hydroxide • 10% Potassium Hydroxide |
| Organic Solvents <ul style="list-style-type: none"> • Alcohols • Nitrils • Disubstituted amides • Tetrasubstituted ureas • Sulfoxides • Sulfone • Pyridines • Nitro compounds | <ul style="list-style-type: none"> • Propanol, ethanol, methanol, glycerol • Acetonitrile • NMP, dimethylformamide (DMF) • 1, 1, 3, 3-tetramethylurea • Dimethyl Sulfoxide (DMSO) • Tetramethylene sulfone • Pyridines • Nitromethane |

Table 2: Lists of chemically compatible compounds with Nunchuck's consumables materials.

| Chemical | Concentration/Composition |
|--|--|
| Acidic /Aqueous (pH<7) | <ul style="list-style-type: none"> • Phosphoric acid • Sulfuric acid |
| Basic/Aqueous (PH>7) | <ul style="list-style-type: none"> • Sodium hydroxide |
| Organic Solvents <ul style="list-style-type: none"> • Acyclic and cyclic hydrocarbons • Aromatic hydrocarbons • Halogenated compounds • Ethers | <ul style="list-style-type: none"> • Pentanes, hexanes, heptane, cyclohexane • Xylenes, toluene, benzene • Chloroform, trichloroethylene • Diethyl ether, dimethoxyethane, tetrahydrofuran |

Table 3: Lists of chemically non-compatible compounds with Nunchuck's consumables materials.



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