ECO JEWELRY HANDBOOK

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A Practical Guide for a Healthy, Safe and Sustainable Studio

CHRISTINE DHEIN

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METAL ARTS GUILD
OF SAN FRANCISCO

Contents

Introduction

In 2013 I created the *Bay Area Green Jewelry Studio Project* to help jewelry educators in the greater San Francisco area make their jewelry classrooms more eco-friendly. The information I presented was compiled from years of research, teaching and lecturing in the US and abroad. That information has been expanded beyond the scope of the original project to address issues for any jewelry classroom, art center, jewelry studio or jewelry store. The dual goals are to provide a safe place to work and at the same time, to minimize harmful effects on our environment.

This book deals with chemicals, processes and ecological impact —all serious topics that span thousands of pages and occupy professions in each field for long careers. Clearly, this is a summary, and just as clearly, there are risks in simplifying complex material. While every attempt has been made to ensure that the information on the following pages is current and accurate, it is the responsibility of the reader to update and apply this information as appropriate for his or her situation.

The guidelines presented here are intended for small scale jewelry studios and schools. Industrial applications are different so companies should seek guidance from their local Occupational Safety and Health Agency (OSHA). The best tools for safety and good health are commonsense and personal awareness. If something causes a rash, or hurts your breathing, stop doing that thing and find an alternative. It's your body and your responsibility to take care of it.

What is Eco Jewelry?

"Eco" is a term (along with "Green") that is used loosely in current American culture, particularly when it comes to the marketing and sales of products. For our purposes, we will assume that you are not reading this handbook because you are motivated by marketing hype, but because you have a genuine desire to do the right thing. Therefore, we will define "Eco Jewelry" as jewelry and other forms of metalwork made from responsibly sourced materials in a studio that uses safe, healthy, and environmentally friendly practices.

Jewelry making is an ancient craft, and many of the techniques we use have been performed in much the same way for hundreds, even thousands of years. Despite its long history, the jewelry industry is just beginning to see the importance of protecting the health of people and the planet as we mine precious materials and manufacture jewelry. Awareness of these issues is relatively new, so there are not always perfect solutions to every problem or "best" answers to every question. This handbook endeavors to provide pertinent information in a compact form that will allow readers to make responsible, informed decisions about studio practices and materials sourcing.

Some readers might encounter unfamiliar terms and for this reason there is a glossary at the end of the book. Please turn to it if needed.

Ecology, n.
1873, Branch of science dealing with the relationship of living things to their environments, coined by German zoologist Ernst Haeckel (1834-1919) as *Okologie*, from Greek *oikos* "house, dwelling place, habitation" + -logia "study of"

We generally think of ecology in terms of how we damage or protect the air, water and plants around us. We might forget that we are one of the "living things" in our environment, which is why it is appropriate—in fact necessary—to include health and studio safety in this book.

PART 1

Health & Safety

Creating and using working methods that ensure health and safety are cornerstones for building a long career as a working jeweler. Reduce risk by minimizing exposure to harmful substances, by substituting less harmful alternatives, by using personal protective equipment, by installing adequate ventilation, and limiting the time and frequency of exposure. This section highlights some points on health and safety that I believe pertain to most working jewelers and deserve particular attention including ergonomics and stretches for injury prevention. Books, articles and websites with additional information on health and safety are listed in the Resources section.

Hygiene

Our hands are our most valuable and most used tool in the shop, which means they can be exposed to chemicals, metals and dust. Develop a hand washing habit to reduce the ingestion of contaminants. Regular, thorough hand washing with a mild, biodegradable soap, including when leaving the shop, can help significantly reduce your exposure.

Chemicals

Less Toxic Alternatives

Identifying hazardous chemicals and practices in the studio is the first step to creating a safer working environment. Once a hazard has been identified, eliminate the product or process if possible, or substitute a less-toxic or less hazardous alternative. The following pages include charts that compare products commonly used in the jewelry studio such as flux, pickle and oxidizers. These products often contain chemicals that are hazardous to your health. Use the charts to help you quickly identify hazardous products you may want to eliminate and to find less toxic alternatives that will meet your needs. Substituting less-toxic alternatives in your daily practices will help create healthier working conditions as well as extend your life and career as a jeweler.

Each product page offers a quick-reference chart as well as a product detail chart with more in-depth information. The quick reference chart includes an overall rating along with a health rating and listing of the product benefits. The product details include working characteristics, health and safety precautions, and proper storage and handling procedures. Remember that even less-toxic alternatives may require proper disposal as hazardous waste after being used in jewelry manufacture.

MULTIPLE BRANDS AVAILABLE

Some of the chemicals described here are proprietary, which means they are made by a specific company and sold under a single trade name. Others are either common products (such as vinegar) or are repackaged by distributors with their own names. In those cases, the "Multiple Brands Available" label is included. The image of a single product is shown for convenience, but this book does not recommend one product over another.

Flux

Fluxes often contain fluoride or chemicals in the fluoride family. Fluoride reduces the melting temperature of flux, allowing it to flow at the temperatures required for soldering. Breathing fluoride fumes is bad for your health. The pages that follow include flux options that do not contain fluoride or related ingredients. Charts for fluxes containing fluoride family ingredients are also included at the end of this section for your reference on the hazards involved.

Quick Reference Charts

❀❀❀❀❀ **Best Choice** – No hazards, eco-friendly

❀❀❀❀ **Excellent Choice** – Minimal hazards, eco-friendly

❀❀❀ **Good Choice** – Some hazards; use with caution

❀❀ **Hazards Present** – Use protection; avoid if possible

❀ **Poor Choice** – Find a less toxic alternative

Health Rating

1 Exposure will cause irritation with only minor residual injury (*example:* acetone).

2 Intense or continued but not chronic exposure could cause temporary incapacitation or possible residual injury (*example:* diethyl ether). Protection advised.

3 Short exposure can cause serious temporary or moderate residual injury. Use protection. (*example:* chlorine).

4 Very short exposure can cause death or major residual injury (*example:* hydrogen cyanide, carbon monoxide, sarin). Find alternatives.

Borax Cone Flux

Overall Rating ❀ ❀ ❀ ❀

Health Rating: 1

Benefits: No toxic fumes

MULTIPLE BRANDS AVAILABLE

Metals	Precious and non-precious.
Form	Solid; add water and grind to make a paste.
Soluable	Water soluble. Requires pickle for removal.
Working Temperature	1369°F (743°C)
Chemicals	Orthoboric acids, sodium borates.
Health Hazards	May cause skin and eye irritation.
Precautions	Use safety glasses, and gloves or barrier cream.
Storage	Keep dry in glass or polyethylene container.
Notes	Soldering: Grind in a ceramic dish or on a marble slab, adding water to create a paste or liquid. Tap water is commonly used but if problems arise, use distilled or bottled drinking water. This is perhaps the oldest and most universal flux. Casting: Add to molten metal when melting.

Firescoff Flux

Overall Rating ❀ ❀ ❀ ❀

Health Rating: 1

Benefits: Fluoride free
Alcohol free
No odor
No outgassing
No pickling required

Metals	Silver, gold, copper.
Form	Spray-on liquid.
Soluable	Water soluble. To remove flux, soak in warm water or use ultrasonic for 2 minutes. Do not dilute.
Chemicals	Ceramic matrix compound, non-metallic oxides.
Health Hazards	None with normal use.
Precautions	Safety glasses, ventilation.
Storage	Avoid low temperatures, store away from strong oxidizers, metal hydrides and alkali metal generating hydrogen gas.
Notes	Aid in reticulation. Provides stray heat protection for gemstones. Prevents scaling of metal alloys. Spray application uses more flux, making it more expensive than other options.

Boric Acid

Overall Rating ❀ ❀ ❀ ❀

Health Rating: 1

Benefits: Minimizes firescale
Inexpensive

MULTIPLE BRANDS AVAILABLE

Metals	Silver and gold.
Form	Dissolve powder in denatured alcohol to use.
Soluable	Water soluble. Remove with pickle.
Melting Temperature	140°F (171°C)
Chemicals	Boric acid.
Health Hazards	Mild irritant.
Precautions	Use safety glasses, gloves or barrier cream. Ventilation recommended.
Storage	Store in a tightly closed container in a cool, well-ventillated area; do not exceed room temperature.
Notes	To prevent firescale and preserve the luster on polished gold pieces, either spray the solution onto warm metal and or dip the work into the solution and burn off the alcohol. Apply flux to joints for soldering.

Pro Craft Jel Flux

Overall Rating ❀ ❀ ❀ ❀

Health Rating: 2

Benefits: Biodegradable
No toxic fumes

Metals	All nonferrous metals.
Form	Gel
Soluable	Water soluble. Requires pickle for removal.
Max. Temperature	1700°F (927°C)
Working Temperature	1100°F (593°C)
Chemicals	Boron oxides.
Health Hazards	Irritant if splashed on skin or mucous membranes. Category 1b reproductive toxicant.*
Precautions	Use safety glasses, gloves or barrier cream Dust or splash mask recommended. Ventilation
Storage	Keep dry in tightly closed container in a cool dry area.
Notes	Recommended for sweat soldering; corrosive.

** Presumed human reproductive toxicants - largely based on animal studies.*

Superior Brazing Flux No. 6

Overall Rating ❀❀❀❀

Health Rating: 2

Benefits: Contains no potassium bifluoride
Will not release boron trifluoride
Helps hold solder in place

Metals	Silver and other non-ferrous metals.
Form	Paste
Soluable	Moderately soluble in water.
Max. Temperature	1600°F (870°C)
Working Temperature	900°F (485°C)
Chemicals	Potassium tetraborate, potassium fluoroborate.
Health Hazards	Overexposure may cause coughing, chills, weight loss, brittle bones, anemia, stiff joints. Any condition of the lungs, kidneys or liver will be aggravated.
Precautions	Use goggles, gloves or barrier cream; Ventilation and respirator recommended Wash thoroughly in case of skin contact
Storage	Store in a plastic container in a cool area. Keep container away from excessive heat.
Notes	Fluorides present with high heat.

Cupronil Flux

Overall Rating ❀❀❀

Health Rating: 2

Benefits: Prevents firescale

Metals	All non-ferrous metals.
Form	Liquid, typically applied by spraying.
Soluable	Water soluble.
Max. Temperature	1500°F (816°C)
Working Temperature	1100°F (593°C)
Chemicals	Boric acid, borax, disodium phosphate.
Health Hazards	Overexposure can cause kidney and liver damage, aggravate respiratory disease and irritate skin.
Precautions	Use goggles, gloves or barrier cream. Ventilation recommended.
Storage	Store away from strong bases in a cool dry area.
Notes	Spray onto warmed metal in several coatings to create a layer that will protect against the creation of firescale and also serve as flux; corrosive.

MY-T-FLUX

Overall Rating ❀ ❀ ❀

Health Rating: 2

Benefits: Holds solder in place
Removes with water

MULTIPLE BRANDS AVAILABLE

Metals	Gold, silver, platinum and other high temperature metals.
Form	Liquid
Soluable	Water soluble.
Boiling Temperature	212°F (100°C)
Chemicals	Sodium borate, ammonium chloride.
Health Hazards	Irritant to eyes and skin. Unhealthy if inhaled or ingested. Category 1b reproductive toxicant.
Precautions	Use goggles, gloves or barrier cream. Ventilation recommended.
Storage	Store in a tightly closed container in a cool, well-ventillated area.
Notes	Preserves metal color and luster .

Stay-Clean Flux

Overall Rating ❀ ❀ ❀

Health Rating: 3

Benefits: Removes with water

Metals	All non-ferrous metals, nickel and steel, but only with low-temperature solders (e.g., Stay-Brite)
Form	Liquid
Soluable	Water soluble.
Working Temperature	430°F (221°C)
Chemicals	Zinc chloride, ammonium chloride, hydrochloric acid.
Health Hazards	Harmful is swallowed or inhaled. Causes severe burns and eye damage. May cause respiratory irritation. Can cause damage to organs such as the optic nerve.
Precautions	Use safety goggles or face protection and gloves. Ventilation required.
Storage	Store in a tightly closed well-marked container.
Notes	• Composition: 96% tin and 4% silver. • Bright silver joint color. • For silver-colored metals such as tin and silver. • Cadmium-free, non-oxidizing. • Not for aluminum.

Tix Flux

Overall Rating ❀❀

Health Rating: 3

Benefits: Removes with water

Metals	All non-ferrous metals, but only with low-temperature solders.
Form	Liquid
Soluable	Water soluble.
Working Temperature	260°F (127°C)
Chemicals	Zinc chloride.
Health Hazards	Can irritate skin and respiratory tract.
Precautions	Goggles, barrier cream and ventilation recommended.
Storage	Keep tightly sealed and away from children.
Notes	Works with any soft solder. Very toxic to aquatic life with long-lasting effects. Avoid release into the environment.

Otto Flux

Overall Rating ❀❀

Health Rating: 3

Benefits: Removes with water

Metals	All non-ferrous metals, nickel and steel.
Form	Paste, dilute with water as desired.
Soluable	Water soluble.
Working Temperature	up to 1600°F (870°C)
Chemicals	Pertroleum, zinc choride, ammonium chloride, potassium fluoroborate.
Health Hazards	May cause burns to eyes and skin. Inhalation of fumes may cause repiratory irritation. May be harmful if swallowed. Weakness in lungs, kidneys or liver will be aggravated.
Precautions	Use safety glasses and NIOSH approved gloves.
Storage	Store in a tightly closed container.
Notes	Corrosive. Flourides with high heat.