USING POLYMER CLAYS TO MAKE MOLDS AND CASTS OF FOSSILS FOR TEACHING AND OUTREACH

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ABSTRACT

Polymer/polyvinyl chloride clays can be used to produce relatively simple detailed molds and casts of fossil teaching specimens for use by students. These "make and bake" clays are available in dozens of colors and can be found in most craft stores. Molds and casts made from polymer clays can be produced within about half an hour using nothing more than a small household toaster oven. These molds and casts are suitable for production of student study materials and even exam materials due to their ability to capture detailed morphology. Importantly, students, or even K-12 children, can fabricate the molds and casts themselves, enhancing "hands-on" activities as well as facilitating discussion of preservation modes (external molds, natural casts, etc.). Polymer molds and casts make ideal specimens for use in outreach activities due to the widespread use of polymer clays in primary and secondary school art classes. Newer formulas of these polymer clays are phthalate- and lead-free and safe for use by children. However, it is probably best to store polymer molds and casts separately from original teaching specimens due to the potential release of hydrochloric acid vapors. We have produced molds and casts of representatives of the following fossil specimens: ammonites, brachiopods, bryozoans, corals, gastropods, mammal osteoderms and teeth, plants, reptile osteoderms and teeth, shark teeth, stromatolites, tracks, and trilobites.

INTRODUCTION

Using polymer clays to make molds and casts of common fossils for teaching introductory students and for outreach activities is a relatively quick and simple process. Going from an original fossil to a polymer clay mold and then to a polymer clay cast can be completed in less than an hour. The ability of polymer clay to capture morphological detail (Figures 1 and 2) along with their durability makes polymer clays a good choice for classroom use. The polymer clay molds and casts can be used for both study and assessment. They can be provided to students for study outside of regularly scheduled classes without worrying too much about breakage or loss. Polymer clay molds and casts can be placed on reserve at institutional libraries for student and public use. Polymer clay molds can easily be used to make casts of specimens as an activity within a typical laboratory or outreach session requiring little more than a small countertop toaster oven, which can be transported to a laboratory or outreach location.

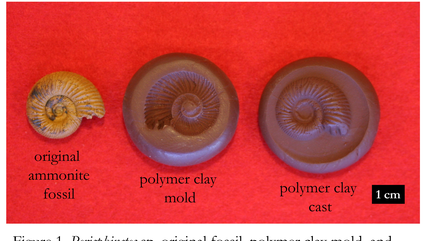

Figure 1. *Perisphinctes* sp. original fossil, polymer clay mold, and polymer clay cast.

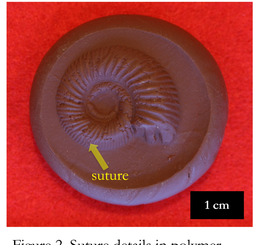

Figure 2. Suture details in polymer clay cast.

MATERIALS & METHODS

The first step is to choose a suitable fossil specimen to mold. Most of the fossils that we have worked with have been about 3-4 cm in size and not very deep. It is often easier to work with fossils that are still embedded in matrix. However, isolated specimens can also be molded relatively easily. We often shape ¼-½ oz of the polymer clay into spheres or cylinders (Figure 3). However, in some cases, polymer clay that has been shaped into cones or wedges may produce better results if the original fossil exhibits a lot of relief. It is best to wear gloves when working with polymer clays to avoid staining your hands with pigment. The spheres, cylinders, cones, or wedges can be pressed directly into the fossil or the spheres and cylinders can be flattened between 2 sheets of laminated paper, resulting in smoother surfaces, and then the fossil can be pressed into the polymer clay and carefully removed (Figure 4). The resulting mold is then placed on parchment paper on a baking sheet and baked at 275° F for 15 minutes for every ¼ inch in thickness.

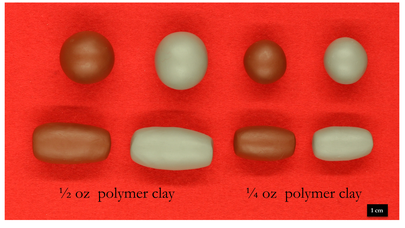

Figure 3. Polymer clays shaped into spheres and cylinders.

Figure 4. Making a mold of a rostral "tooth" from *Onchopristis numidus*.

Once the mold has cooled (~10-15 minutes for ¼ inch thick mold), it can be pressed directly into spheres, cylinders, cones, or wedges of polymer clay to produce casts (Figures 5-7). This method is referred to as the "push mold" method by Heaser (2004). The casts are then baked and cooled just like the molds. It should be noted that overworking the clay may cause it to stick to the fossil or the mold and adding a resting period of 15-30 minutes between shaping the clay and molding or casting should prevent the clay from sticking. Shaping the clay prior to lab or outreach activities is recommended. We have started painting our polymer clay casts with medium-viscosity or "soft-body" acrylics (Figure 8). Storing polymer molds and casts separately from original teaching specimens is advised due to the potential for release of hydrochloric acid vapors (Leiggi and May, 1995; Mills and White, 1994).

Figure 5. Mold and polymer clay cylinder

Figure 6. Mold pressed into polymer clay cylinder.

Figure 7. Mold and unbaked cast.

USE IN TEACHING & OUTREACH

We have used polymer clay molds and casts in activities with students ranging from primary school to college undergraduates in classrooms and outreach events. Primary school students made polymer clay casts of ammonite specimens from polymer clay molds. Secondary school students matched polymer clay casts with their corresponding polymer clay molds and original fossils (Figure 9). Undergraduate students made polymer clay casts from polymer clay molds from a variety of fossil taxa and also prepared brief presentations about their selected fossil taxa that included images of the polymer clay casts they made. Polymer clay molds and casts have also been used to help students differentiate between body fossils and trace fossils (Figure 10). Polymer clay also allows teachers who only have single specimens of fossil types to quickly and cheaply create duplicates so that each group of students can have their own fossils to work with.

Figure 8. a. *Holmesina* osteoderm, b. *Cyclonema* shell, c. *Dasypus* osteoderm, d. *Glyptorthis* shell, e. stromatolite/oncolite, f. rugose coral, g. *Neuropteris* leaflet, h. *Archimedes*, i. *Hemipristis* tooth, j. Triassic amniote footprints, k. *Elrathia*, l. *Trichechus* tooth, m. *Glyptotherium* osteoderm, n. *Globidens* tooth, o. *Perisphinctes* shell, p. *Borealosuchus* osteoderm.

Figure 9. Matching casts, molds, and fossils activity.

Figure 10. Concept-sorting activity for differentiating trace and body fossils.

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