

6-1-2021

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Recommended Citation

Haneman, Victoria J. (2021) "Alkaline Hydrolysis," *ACTEC Law Journal*: Vol. 47: No. 1, Article 8.
Available at: <https://scholarlycommons.law.hofstra.edu/actecj/vol47/iss1/8>

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Alkaline Hydrolysis

Victoria J. Haneman*

I. INTRODUCTION

Hollywood has developed its own villainous death disposition trope that is often a link in a nefarious narrative chain—disposition of human remains through some form of chemical dissolution. Spanning decades and genre, popular cinema and television have warmly embraced liquification of the dead, including but not limited to *The Wizard of Oz*,¹ *House on Haunted Hill*,² *Thief*,³ *Who Framed Roger Rabbit*,⁴ *Point of No Return*,⁵ *Palmetto*,⁶ *Walker, Texas Ranger*,⁷ *NCIS*,⁸ *Bones*,⁹ *The Wire*,¹⁰ *Breaking Bad*,¹¹ *Dexter*,¹² *Blacklist*,¹³ *Homeland*,¹⁴ *Elementary*,¹⁵ *10 Cloverfield Lane*,¹⁶ *Ozark*,¹⁷ and *Rick and Morty*.¹⁸ The specifics vary dramatically from one work of fiction to the next but the common thread of the trope is the immutability of the erasure. Al-

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¹ *WIZARD OF OZ* (Metro-Goldwyn-Mayer 1939).

² *THE HOUSE ON HAUNTED HILL* (William Castle Productions 1959).

³ *THIEF* (Mann/Caan Productions 1981) (noting “the moment when he reveals his insidious nature – while the body of Frank’s buddy Barry (James Belushi) is being dissolved in acid – is terrifying”).

⁴ *WHO FRAMED ROGER RABBIT* (Touchstone Pictures 1988).

⁵ *POINT OF NO RETURN* (Warner Bros. 1993).

⁶ *PALMETTO* (Castle Rock Entertainment 1998).

⁷ *Walker, Texas Ranger: Saturday Night* (CBS television broadcast Feb. 10, 2001).

⁸ *NCIS: Sub Rosa* (CBS television broadcast Nov. 18, 2003).

⁹ *Bones: The Truth is in the Lye* (Fox Broadcasting Co. television broadcast Sept. 27, 2006); *Bones: The Prisoner In The Pipe* (Fox Broadcasting Co. television broadcast Apr. 2, 2012).

¹⁰ *The Wire: Boys of Summer* (HBO television broadcast Sept. 10, 2006).

¹¹ *Breaking Bad: Cat’s In The Bag* (AMC television broadcast Jan. 27, 2008).

¹² *Dexter: Circle Us* (Showtime television broadcast Nov. 7, 2010).

¹³ *Blacklist: The Stewmaker* (NBC television broadcast Oct. 14, 2013).

¹⁴ *Homeland: A Red Wheelbarrow* (Showtime television broadcast Nov. 17, 2013).

¹⁵ *Elementary: The Adventure of the Nutmeg Concoction* (CBS television broadcast Dec. 11, 2014).

¹⁶ *10 CLOVERFIELD LANE* (Paramount Pictures 2016).

¹⁷ *Ozark: Sugarwood* (Netflix, Media Rights Capital television broadcast July 21, 2017).

¹⁸ *Rick and Morty: The Vat of Acid Episode* (Cartoon Network television broadcast May 17, 2020).

though the storyline typically ambles onward, the decedent is eliminated in a way that leaves no trace.

It is past time that alkaline hydrolysis (also known as liquid cremation, water cremation, organic cremation, bio cremation, or aquamation) bucks the Hollywood trope in favor of a modern rebranding.¹⁹ Although incineration-based cremation is more environmentally friendly than traditional burial, it falls short of being ideal because of the energy required and air emissions produced.²⁰ Alkaline hydrolysis or liquid cremation is a clean, green alternative to fire-based cremation, using only 10% of the energy and producing no air emissions.²¹ It is a process that essentially liquifies a corpse, leaving behind bones that can be ground to produce ash and returned to loved ones.²²

Alkaline hydrolysis is legal for commercial-use in twenty states as of 2020.²³ The purpose of this Essay is to consider the way in which the law is being leveraged to obstruct this innovative death technology from being more broadly available to consumers.

II. THE PROCESS

Traditional fire-based cremation uses an oven to accelerate decomposition and reduce human remains to sterile ash, whereas alkaline hydrolysis usually uses the death industry-equivalent of either a pressure

¹⁹ *Alkaline Hydrolysis*, CREMATION ASS'N N. AM., <http://www.cremationassociation.org/page/alkalinehydrolysis> [<https://perma.cc/3Y8T-Z9J5>].

²⁰ See Becky Little, *The Environmental Toll of Cremating the Dead*, NAT'L GEOGRAPHIC (Nov. 5, 2019), <https://www.nationalgeographic.com/science/article/is-cremation-environmentally-friendly-heres-the-science> [<https://perma.cc/W3JF-6DAQ>].

²¹ Sara Marsden-Ille, *Aquamation or Resomation: A 'Green' Alternative to the Traditional Funeral*, US FUNERALS ONLINE (June 30, 2021), <https://www.us-funerals.com/aquamation-or-resomation/#.YUUnvBNKho5> [<https://perma.cc/63PB-D56Z>].

²² Devin Powell states as follows:

Eight times a year a funeral director sets off by boat from Camp Pendleton Marine Corps base carrying about two dozen plastic bags filled with unusual human remains. The powder he pours overboard is from corpses that have been 'cremated'—not by fire, but by liquid. That's how the University of California, Los Angeles, disposes of bodies donated to science: by dissolving the flesh off their bones. The bones are then ground to dust and scattered into the sea two miles offshore, forming white rings that slowly float away into the Pacific Ocean.

Devin Powell, *Dissolve the Dead? Controversy Swirls Around Liquid Cremation*, SCI. AM. (Sept. 7, 2017), <https://www.scientificamerican.com/article/dissolve-the-dead-controversy-swirls-around-liquid-cremation> [<https://perma.cc/SU2E-A9TL>].

²³ Adina Solomon, *More States Legalize Dissolving Bodies in Water*, U.S. NEWS (Mar. 12, 2020), <http://www.usnews.com/news/best-states/articles/2020-03-12/more-states-legalize-alkaline-hydrolysis-dissolving-dead-bodies-in-water> [<https://perma.cc/N2PK-WF4K>].

cooker or steel vessel²⁴ to reduce the body to a sterile effluent that may safely be drained down a municipal sewer system.²⁵ When the process is complete, absolutely no DNA, RNA, or human tissue remains.²⁶ And in truth, the process itself is not new.²⁷ Alkaline hydrolysis is the only method effective at destroying the deadly prions that cause bovine spongiform encephalopathy or mad cow disease, and so it has been used for some time to destroy infected cattle.²⁸ A variation of alkaline hydrolysis called resomation, using high heat (170° F) for three hours, has also been used in the United States since the mid-2000s²⁹ to dispose of bodies donated to science.³⁰ And interestingly, resomation was listed by TIME Magazine as one of the year's top ten environmental ideas in 2009.³¹

The process itself may slightly vary from operator to operator. The remains are usually placed in a stainless steel cylinder or vessel that slides into a vat of heated solution (often some combination of an alkaline, water, and/or acetic acid),³² which may or may not be pressurized, for four hours to twenty-four hours³³ until the body is reduced to

²⁴ An Instant Pot is one type of a pressure cooker, though perhaps the most commonly known. See *Instant Pot vs. Pressure Cooker: What's the Difference?*, KITCHEN MASTERY, <https://thekitchenmastery.com/instant-pot-vs-pressure-cooker> [<https://perma.cc/TK8X-MT3V>].

²⁵ CREMATION ASS'N N. AM., *supra* note 19.

²⁶ *Id.*

²⁷ See Joseph H. Wilson, *The History of Alkaline Hydrolysis*, NAT. FUNERAL, <https://www.thenaturalfuneral.com/wp-content/uploads/2019/10/History-of-Alkaline-Hydrolysis.pdf> (noting that the process was first patented on Christmas 1888).

²⁸ Marina Kamenev, *Aquamation: A Greener Alternative to Cremation?*, TIME (Sept. 28, 2010), <http://content.time.com/time/health/article/0,8599,2022206,00.html> [<https://perma.cc/L45X-GJKL>].

²⁹ *Id.* Minnesota was the first state to legalize alkaline hydrolysis in 2003 and this technology was used, most notably, by the Mayo Clinic in Rochester, Minnesota. See Philip R. Olson, *Flush and Bone: Funeralizing Alkaline Hydrolysis in the United States*, 39 J. SOC'Y FOR SOC. STUD. SCI. 666, 672 (2014).

³⁰ Kamenev, *supra* note 28.

³¹ *Id.*

³² E-mail from Ed Gazvoda, Pres., Fireless Cremation, to Victoria J. Haneman (Oct. 5, 2021, 3:31PM CST) (on file with author).

³³ *Id.*

bones.³⁴ The soft, brittle bone material (calcium phosphate)³⁵ may then be crushed and presented to the family in much the same way as traditional cremation ashes.³⁶ The process can take as little as three hours but varies in duration according to the heat and pressure applied.³⁷ The effluent produced by the process contains amino acids, peptides, and soap and is free from all human tissue, DNA, embalming fluid, cytotoxic agents, and biological or chemical warfare agents.³⁸ Any metal devices implanted in the decedent may be recycled.³⁹

III. OBSTACLES

Several practical obstacles stand in the way of alkaline hydrolysis being a process that is broadly accepted. The first obstacle may colloquially be referred to as the “ick” factor. The process of alkaline hydrolysis leans into the notion of oozing, leaking, seeping, and gushing that is associated with untended corpses. We generally turn to the professionalized death industry to either significantly decelerate or accelerate decomposition, but in both instances, to neatly contain and package the process. Modern society deeply fears contamination from the untended deceased body that bursts beyond its corporeal limits⁴⁰ and a fluid-based process will therefore always be considered rather cringeworthy.

Another objection to alkaline hydrolysis is, interestingly, one raised whenever almost any discussion of death care approaches outside of the norm of traditional burial is raised: *what about the drinking water?* This objection was skillfully played by one lawmaker (coincidentally, also a casket maker) in the state of Indiana to derail the legalization of alkaline hydrolysis there, “We’re going to put them in acid [sic] and just let them dissolve away, and then we’re going to let them run down the

³⁴ Marina Kamenev states:

“Potassium hydroxide is similar to the stuff you use to clean the oven. It has that soapy feel that strips your fingerprints if you accidentally get it on your hands. If you can imagine the way that it dissolves leftover cooking fats, well, the solution does the same thing with a human body.” Hibbert adds that the remaining liquid would have to be neutralized to be poured over living plants. “It might be too high in alkalinity initially, but the right amount of vinegar or citric acid would correct that.”

Kamenev, *supra* note 28.

³⁵ Olson, *supra* note 29, at 667.

³⁶ See Kamenev, *supra* note 28.

³⁷ It is important that machines designed for speed (higher temperatures and higher pressures) be no less safe for the operator. See Olson, *supra* note 29, at 668.

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ See *id.* at 676.

drain out into the sewers and whatever.”⁴¹ Incidentally, byproducts from embalming and funeral homes are also going into the municipal sewer system. So long as any death disposition process satisfies local codes in its use of the municipal sewer system, it makes little sense to discriminate against one sewer-user in favor of another sewer-user.⁴² Alkaline hydrolysis poses no greater threat than any other method currently in use.

The third obstacle to this innovative process is rooted in the notion of the corpse as sacred. The objection that disposition is undignified, disrespectful, or irreverent sits on the shifting sand of moral judgment—changing over time and varying based on culture. To the extent that moral judgment has a place in regulation of the industry, there are several scientific and technical assessments of alkaline hydrolysis that arrive to the conclusion that it is morally equivalent to traditional fire-based cremation in terms of treatment of human remains with dignity and respect.⁴³

Perhaps the most important obstacle—because of the breadth of its impact upon regulation and lawmaking—is that which stands in the path of the innovator, discussed in Section IV.

IV. THE PROBLEM WITH BEING A POTENTIAL DISRUPTOR

Regulatory capture is an issue that exists when an industry has gained excessive influence or power, such that lawmakers or regulators are puppets of the industry itself.⁴⁴ There is an incentive within the marketplace to maintain and preserve status quo, and to do so, perhaps barriers to entry are created or costs are unnecessarily imposed. Regulatory capture is not binary, but rather, exists on a spectrum (sometimes weak and sometimes strong) and does not always lurk in the light, but is nonetheless often quite obvious.⁴⁵ It is a difficult issue with which to contend

⁴¹ Powell, *supra* note 22.

⁴² “What goes into the waste water treatment system is probably cleaner than most things that go into the waste water treatment system from our house or hospitals or nursing homes or other places.” Ben Gruber, *Florida Funeral Home Offers Eco-Friendly Cremations*, REUTERS (Oct. 11, 2011, 11:21 AM), <https://www.reuters.com/article/us-usa-cremation-idCATRE7995ZS20111011> [<https://perma.cc/K2D7-J9QZ>].

⁴³ See Philip R. Olson, *Basic Cremation*, 8 WAKE FOREST J. L. & POL’Y 149, 167-68 (2018) (discussing pieces published by Sister Renee Mirkes and Kent J. Lasnoski in the *National Catholic Bioethics Quarterly*).

⁴⁴ This is a topic that has been discussed since at least the 1950s. See Dorit Rubinstein Reiss, *The Benefits of Capture*, 47 WAKE FOREST L. REV. 569, 570-71, 580 (2012).

⁴⁵ Daniel Carpenter, *Challenges in Measuring Regulatory Capture*, REGUL. REV. (June 22, 2016), <http://www.theregreview.org/2016/06/22/carpenter-challenges-measuring-regulatory-capture> [<https://perma.cc/XCC5-BQGN>].

because we have no set measurements as to when it exists.⁴⁶ And yet, patterns of rent-seeking emerge—when the game seems rigged—and it seems fairly obvious that capture exists somewhere on the proverbial spectrum. There is reason to believe that regulatory capture,⁴⁷ to some extent and in some (but perhaps not all) states, is an issue in the death care industry.⁴⁸ Lawmakers often rely heavily, and sometimes almost exclusively, upon the industry—both for guidance in lawmaking and regulatory oversight.⁴⁹ In this marketplace, a root cause of expense is also a structural barrier impeding legalization of new death care tech: some state laws to regulate the industry are enacted with the goal of preserving the status quo, but in doing so, unnecessarily impose costs.⁵⁰ It is well established that heavy-handed regulation reduces investment

⁴⁶ “[T]here is virtually zero government effort to systematically identify, prevent, and root out regulatory capture.” Sheldon Whitehouse, *How Government Can Root Out Regulatory Capture*, REGUL. REV. (June 15, 2016), <http://www.theregreview.org/2016/06/15/whitehouse-how-government-can-root-out-regulatory-capture> [<https://perma.cc/WLW4-2RT6>].

⁴⁷ Patricia Sabatini, *Last rites: Pennsylvania’s Funeral Regulators Failing Consumers, Report Finds*, PITT. POST-GAZETTE (July 1, 2021, 5:50 AM), <http://www.post-gazette.com/business/money/2021/07/01/Pennsylvania-State-Board-Funeral-Directors-Consumer-Federation-America-Funeral-Consumers-Alliance/stories/202106280094> [<https://perma.cc/868Q-4NBLL>] (observing that most states have oversight boards with a supermajority of members from the funeral industry and “[t]hey see themselves as serving the funeral industry rather than the consumer”); see also Adam Gottschalk, *Giving Up the Ghost: How the Funeral Rule and State Licensing Boards Are Failing to Protect Consumers from Underhanded Undertakers*, 27 ELDER L.J. 423, 430 (2019) (citing to Illinois’s seven member funeral board, and all seven members are licensed funeral providers, which seems to be the norm).

⁴⁸ Two interesting recent examples relevant to death care services have made headlines. There is the case of the monks of Saint Joseph Abbey of Saint Benedict in Louisiana, who violated a rent-seeking state criminal statute when they sold handmade cypress caskets from local fallen trees without a funeral director’s license. See George F. Will, *George Will: Will the Supreme Court Answer Monks’ Prayers?*, WASH. POST (Nov. 14, 2012), https://www.washingtonpost.com/opinions/george-will-will-the-supreme-court-answer-monks-prayers/2012/11/14/ec6a30c8-2dcb-11e2-beb2-4b4cf5087636_story.html [<https://perma.cc/5AFQ-DS49>]. There is, second, a successful suit brought against the Pennsylvania State Board of Funeral Directors. The allegation in the filing was that “the relationship between the state board and [the Pennsylvania Funeral Director’s Association] has developed to such an extent that the relationship is the quintessential example of a trade association’s regulatory capture of its state regulatory agency.” Chris Mondics, *Judge Overturns Pa. Funeral Regulations*, PHILA. INQUIRER (May 15, 2012), http://www.inquirer.com/philly/business/20120515_Judge_overturns_Pa_funeral_regulations.html [<https://perma.cc/R8W6-Y2V4>].

⁴⁹ The death care industry is largely regulated through boards that are dominated by funeral industry seats. In a random sample of 20 states and 123 available board seats, 87 seats were controlled by the industry (or 70%) (source on file with author).

⁵⁰ Most of the industrialized rest of the world manages to honor the remains of their deceased without use of toxic chemicals and embalming. In the United States, embalming is just one (often unnecessary) expense that has been layered into the commodification of

incentives, stymies innovation, and reinforces tradition. Entry barriers also prevent important processes of creative destruction, preventing the growth and evolution of a marketplace.⁵¹

The struggle to broadly legalize the process of alkaline hydrolysis suggests the need for a new era of “light-touch” regulation by state lawmakers regulating the death care industry,⁵² or an approach by which the government stays out of the way to allow market forces to shape the marketplace.⁵³ In a marketplace where law and regulation is arguably used both as sword and shield, a new era of light-touch state regulation may inure to the benefit of the death consumer by drawing capital investment to the space, increasing innovative death tech, re-shaping access to information for consumers, and implicitly lowering consumer cost.⁵⁴ Although exhaustive discussion of light-touch regulation is outside of the scope of this thought piece, an example would be allowing any innovative technology to come to market on a probationary basis after satisfying public health and safety assessments (with little to no input from incumbent death care professionals).⁵⁵

Only twenty states have legalized the process of alkaline hydrolysis.⁵⁶ Legalization efforts often meet with protest⁵⁷ from the funeral in-

death care. See Victoria J. Haneman, *Funeral Poverty*, 55 U. RICH. L. REV. 387, 422-25 (2021).

⁵¹ See *id.* at 437.

⁵² See John Blevins, *The Use and Abuse of “Light-Touch” Internet Regulation*, 99 B.U. L. REV. 177, 185 (2019).

⁵³ *Id.*

⁵⁴ “Light touch” regulation has historically described a regulatory approach with reduced government involvement under Title I, in which the government only regulates when there is a market failure. Although it is outside of the scope of this Essay to consider its broad application to the death care market, light touch regulation would be applied here to mean government regulation only when necessary to protect public health or safety, with informed policy-making supported by data, evidence, medical professionals, and so forth. See Jay S. Kaplan, *Finding the Middle Ground: A Proposed Solution to the Net Neutrality Debate*, 26 GEO. MASON L. REV. 230, 231 (2018).

⁵⁵ An article comprehensively addressing the issue of light-touch state regulation for the death care industry is forthcoming.

⁵⁶ Tyler Heneghan, *Dying for a Greener Tomorrow: Legalizing Alkaline Hydrolysis*, B.U. SCH. LAW (Jan. 24, 2020), <http://sites.bu.edu/dome/2020/01/24/dying-for-a-greener-tomorrow-legalizing-alkaline-hydrolysis> [<https://perma.cc/Y3CN-AWFU>].

⁵⁷ As of May 2021, a legislation to legalize alkaline hydrolysis in Hawaii is being strongly opposed by Hawaii’s funeral industry. Mahealani Richardson, *Despite Strong Opposition, Advocates Push to Legalize ‘Water Cremation’ In Hawaii*, HAW. NEWS NOW, <http://www.hawaiinewsnow.com/2021/05/11/advocates-push-legalized-water-cremation-hawaii-despite-funeral-industry-opposition> (May 11, 2021, 10:38 PM) [<https://perma.cc/SNT4-SS2A>].

dustry, casket companies,⁵⁸ and the Catholic Church.⁵⁹ Self-interested opposition impedes innovation. This technology has been proven safe and efficient,⁶⁰ with environmental benefits not available with most other modern methods of disposition.⁶¹ There is no time like the present to disrupt the status quo in death care. The aging of the Baby Boomer population⁶² coincides with the “death positive” movement: bringing transparency, humanity, and personalization back to the treatment of human remains.⁶³ Applying a light-touch to regulation within this space has the potential to open the door to new and innovative death technologies.⁶⁴

⁵⁸ Caskets range in price from \$2,000 to \$10,000 in price and substantially increase the cost of death care. Alkaline hydrolysis eliminates the need for a pricey casket. It stands to reason that casket-makers are concerned. See *Funeral Costs and Pricing Checklist*, FED. TRADE COMM’N (July 2012), <https://www.consumer.ftc.gov/articles/0301-funeral-costs-and-pricing-checklist> [<https://perma.cc/7AN7-AWNK>].

⁵⁹ It has been said that “the [Catholic] Church’s permission of [fire-based] cremation is a grudging permission,” but that the permission does not extend to water-based cremation or human aquamation. It is, however, troubling if the loudly expressed opinion of the Catholic Church operates to block safe and innovative death technology from coming to market for use by non-Catholics. Damian Lenshek, *Alkaline Hydrolysis and You*, DIOCESE MADISON CATH. HERALD (May 26, 2021), <https://madisoncatholicherald.org/alkaline-hydrolysis> [<https://perma.cc/YK5D-7RRY>].

⁶⁰ “The introduction of AH into US deathcare culture is no grassroots movement. System designers, distributors, marketers, and providers have worked hard—often against the current of uncomplimentary media depictions—to educate the public and state lawmakers about the AH process and the science behind it.” Olson, *supra* note 29, at 673.

⁶¹ “Every person who becomes liquid instead of ash would keep about 180 kilograms of carbon dioxide out of the atmosphere, according to the TNO report. That’s about as much as the typical U.S. citizen is responsible for emitting in just a few days.” Powell, *supra* note 22.

⁶² The U.S. Census Bureau projects that all Baby Boomers will be older than age 65 by 2030. *Older People Projected to Outnumber Children for First Time in U.S. History*, U.S. CENSUS BUREAU, <http://www.census.gov/newsroom/press-releases/2018/cb18-41-population-projections.html> (Oct. 8, 2019) [<https://perma.cc/QK9T-LQJL>].

⁶³ “While White patriarchy has spent the past hundred years shutting the doors and pulling the curtain—obfuscating and profiting from one of life’s most significant milestones—modern women are questioning whom our current system is serving and telling the funeral industry that its time is up.” Sarah Chavez, *The Story of Death is the Story of Women, YES!* (Aug. 22, 2019), <http://www.yesmagazine.org/issues/death/dying-feminist-funeral-women-caitlin-doughty-20190821> [<https://perma.cc/L8KX-KYDS>].

⁶⁴ Alkaline hydrolysis is presenting a unique challenge to the traditional funeral industry: should the process be classified as cremation or something entirely new? The classification is not purely semantic. Some states require that cremation facilities be located on cemetery property. If not classified as cremation, funeral homes may begin to offer the process in their existing facilities (untethered to cemeteries). As briefly touched upon in this article, these types of (often absurd and unnecessary) regulatory obstacles impede innovation and unnecessarily drive costs. See *Cremation Explained, Answers to Frequently Asked Questions*, FUNERAL CONSUMERS ALL., <https://funerals.org/?consum>

V. CONCLUSION

There is no question that alkaline hydrolysis or liquid cremation could desperately use an image makeover thanks to popular culture references in American media.⁶⁵ It is unlikely, however, that popular media is the reason that a safe, efficient, inexpensive, environmentally-friendly approach to disposition of remains has not been legalized in roughly thirty states.⁶⁶ New death care technology has the potential to completely disrupt the marketplace over the next two decades—with processes in development to compost or freeze-dry remains. If rent-seeking barriers to entry are being created by industry regulators and lawmakers, it is important that these issues be identified to prevent the strangling of innovation.

ers=cremation-explained-answers-frequently-asked-questions [https://perma.cc/83CJ-9PBW].

⁶⁵ There is a rising interest in personalized, innovative, and creative ways to transition “cremains” (or traditional cremated remains) into memory or tribute products, and these approaches could easily be applied in the context of alkaline hydrolysis. See *Latest Trends Coming in 2021 for Cremation Ashes*, SMART CREMATION, <https://www.smart-cremation.com/articles/unique-ways-to-keepsake-your-loved-ones-cremains> [https://perma.cc/S9C6-ACW8]. By way of example, perhaps a modern rebranding approach for liquid cremation could involve the use of liquid effluent from the cremation process to create a snow globe that a loved one may place on a mantle in tribute to the deceased.

⁶⁶ Heneghan, *supra* note 56.

