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Liquid Invisibility Cloak

The purpose of this study was to investigate the visibility of glass objects immersed in liquids. I hypothesized that if a glass object is immersed in a liquid having a similar or the same refractive index as that of the glass, the liquid will create an “invisibility” cloak around the object. In such a case one could determine the refractive index of an unknown glass material from the known liquid refractive index.

Several glass objects were immersed in over 20 types of liquids. The liquids included common household liquids such as dishwasher soap, vinegar, and sugar water, various solvents available from the local hardware store, and several essential oils from an apothecary. The visibility of each glass object was recorded as it was immersed sequentially in the liquids.

It was found that jasmine oil, which has a refractive index of n= 1.475, acted as a good cloak for a glass stirring stick. Similarly, 4-mm diameter glass spheres (used for ball bearings) were made nearly invisible by toluene (paint thinner), which has an index of n = 1.496.

The experiments revealed that glass objects could be made invisible by immersion in a liquid. As the refractive index of jasmine oil is within 0.001 of that of Pyrex, it was concluded that the stirring stick is made of Pyrex. The refractive index of toluene is very close to some types of crown glass, therefore it was concluded that the spheres were made of crown glass.