

## How to Disperse INVIZ™ in Water

INVIZ™ is soluble in a certain range of aqueous alcohol solutions but is only slightly soluble in water at pHs lower than 12. However INVIZ™ dispersions can be made in water at low pHs. If a dispersion that stays suspended without stirring is required follow the procedure “How to Disperse an Aqueous Alcohol-Based INVIZ™ Solution in Water.”

### A. Safety

- 1) Safety glasses
- 2) Refer also to your institution’s internal lab safety guidelines

### B. Chemicals

- 1) INVIZ™
- 2) Cold water
- 3) Acid for pH adjustment (Ex. 6 N hydrochloric acid)
- 4) Plasticizer (optional). A list of INVIZ™ plasticizers is available upon request. (Ex. propylene glycol)  
Plasticizers may assist with film forming and may reduce chalky appearance of the dried dispersion.

### C. Equipment

- 1) Flask or similar container
- 2) Balance / scale
- 3) Grinder (if INVIZ™ is not already finely ground)
- 4) Mixer or stirrer
- 5) pH meter
- 6) Disposable pipettes
- 7) Moisture balance or oven (if plasticizer is used)
- 8) 1-5 mL macropipette (if plasticizer is used)

### D. Procedure

- 1) Step one
  - a) If INVIZ™ is not already finely ground, grind using a grinder.
  - b) Weigh out a desired mass of cold water into a flask or similar container (Ex. 200 g). Caution: warm water may cause the INVIZ™ to gum up.
  - c) Weigh out a sample of finely ground INVIZ™ equal to up to 20% of the weight of the cold water. (Ex. 10% (w/w) INVIZ™ x 200 g cold water = 20 g INVIZ™)
  - d) Very slowly add the INVIZ™ to the vigorously agitated cold water (to prevent clumping) and allow dispersion to continue stirring.
- 2) Step two
  - a) While monitoring with a pH meter, adjust the pH of the solution by adding drops of acid (Ex. 6 N HCl) with a disposable pipette until the desired pH is reached (a pH of ~4.9 or lower is recommended).
- 3) Step three (optional)
  - a) If a plasticizer is desired, determine an appropriate plasticizer. (A list of INVIZ™ plasticizers is available upon request.)
  - b) Determine the percent solids of the dispersion using a moisture balance or standard oven method.

- c) Calculate desired percentage of plasticizer to add. (Ex. 30% (w/w) of the crude protein of an aliquot of the dispersion. If a 100g aliquot of the dispersion is 7% solids which is entirely INVIZ™ and INVIZ™ is 89% crude protein (%db), 30% of the mass of the crude protein in the aliquot would give the amount of plasticizer to add. Example values are given below.) inviz.com

Mass of Dispersion Aliquot (g):	Percent Solids of Dispersion (%):	Mass INVIZ™ in Aliquot (g):	Crude Protein of Dispersed INVIZ™ (% db):	Mass Crude Protein in Aliquot (g):	Percent of Propylene Glycol to be Dissolved (%/Mass Crude Protein):	Mass Propylene Glycol to be Dissolved (g):	Density of Propylene Glycol (g/mL):	Volume Propylene Glycol to be Dissolved (mL):
100.0	7.00%	7.00	89	6.23	30%	1.87	1.036	1.804

- d) Weigh out the desired aliquot of the dispersion.
- e) Add the volume of plasticizer calculated (if desired) to the agitated dispersion using the macropipette and allow to continue stirring.
- 4) Step four
- a) The dispersion is ready for application. There are a number of ways to apply the solution to the object to be treated including spray coating and submersion. If the dispersion settles out after agitation has ceased, simply re-agitate. The shelf life of the dispersion is limited.