

Tensile Testing of Medical Adhesives | Using a Variable Angle Peel Fixture

Medical adhesives are widely used in the biomedical industry for applications such as bandages, secondary dressings, and wound closure. The adhesive strength of these products must be clearly defined before put to use in a clinical setting. If the adhesive is not strong enough, the product may lead to infection or poor healing. If the adhesive is too strong, the underlying tissue may become damaged upon removal.

One of the challenges in conducting a peel test to evaluate different adhesives is simulating the environment in which the product will be used. The angle of peel and the type of substrate used must be carefully selected in order to accurately understand the adhesion properties during normal use.

Test Configuration and Sample Preparation

A 3345 Electromechanical test frame configured with a 50 N load cell, a single 250 N capacity pneumatic grip with 25 mm x 25 mm flat metallic faces and the variable angle peel fixture were used for this test. The variable angle peel fixture was set at a 135-degree angle, to best simulate the line of pull that would be seen during normal use of the adhesive product. The complete test configuration is shown in Figure 1. The test methodology called for a test speed of 5 mm/min. Leather was used as the substrate during this test to best simulate the surface properties of human skin and is shown in more detail in Figure 2.

The Bluehill® 2 Peel, Tear and Friction Software Module is highly recommended for this type of test. This software module allows for measurement of the first peak load, average load and average load per width, the most commonly used calculations. Two different samples were tested to demonstrate different adhesion properties and results.

Results

The results show that this test configuration was successful in testing medical adhesive specimens. The data was fairly consistent and is shown in Figures 3 and 4 and Tables 1 and 2.

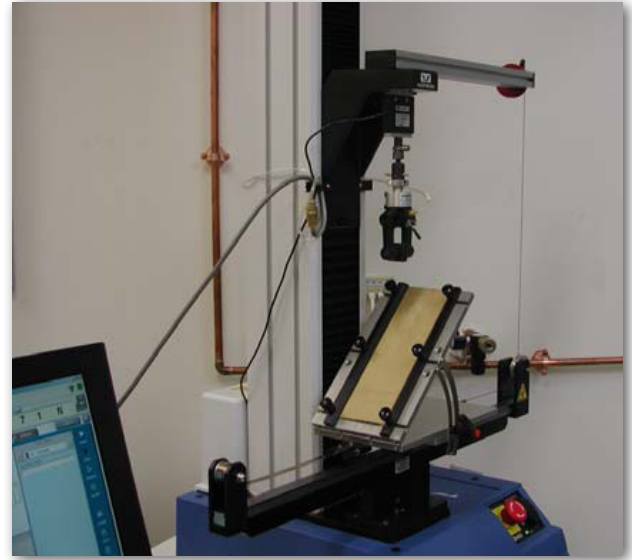


Figure 1:
The recommended test configuration for testing medical adhesives using a variable angle peel fixture.



Figure 2:
Close up of specimen during peel test using leather as a substrate to simulate the surface properties of skin.

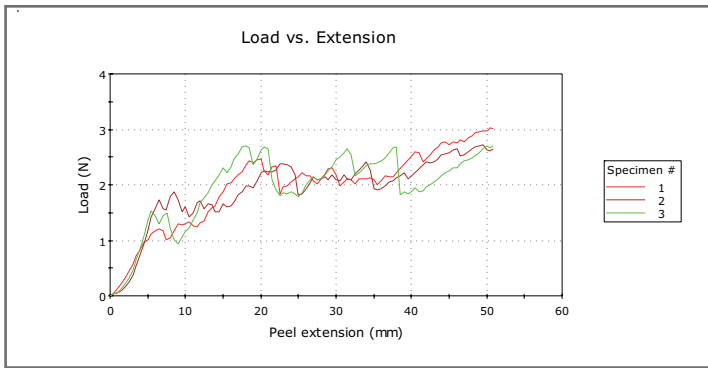


Figure 3: Load vs. Extension results for three adhesive specimens in Sample A.

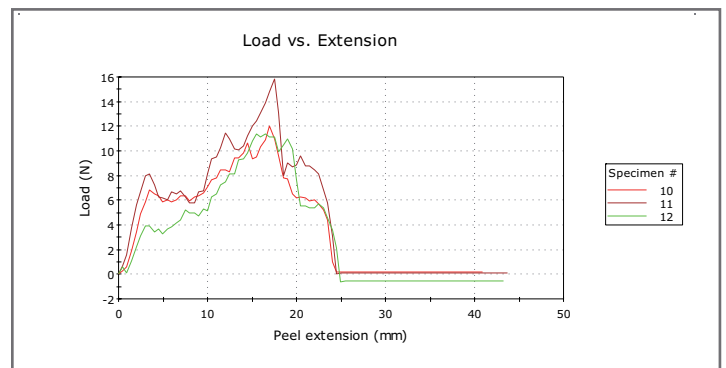


Figure 4: Load vs. Extension results for three adhesive specimens in Sample B.

Specimen Label		Average Adhesive Strength
		N
1	A-1	2.197
2	A-2	2.100
3	A-3	2.239
Mean		2.179
S.D.		0.072

Table 1: Adhesive strength results for three specimens in Sample A.

Specimen Label		Average Adhesive Strength
		N
1	B-10	10.661
2	B-11	11.341
3	B-12	10.755
Mean		10.919
S.D.		0.369

Table 2: Adhesive strength results for three specimens in Sample B.

Conclusions and Recommendations

In conclusion, hydrogels can easily be tested using the previously described configuration. It is recommended that the distance between the faces be increased slightly before specimen loading to decrease the chance of breaking or crushing the material upon grip closure.

Configuration Table

Catalog Number	Configuration Options	Description
3345	Frame	Single column test frame
2519-102	Load Cell	50 N Capacity
2712-002	Grips	250 N Pneumatic Grips
2702-004	Faces	25 mm x 25 mm flat metallic faces
2820-036	Peel Fixture	Variable angle peel test fixture
2410-270U1	Software	Bluehill® 2 software with peel application

