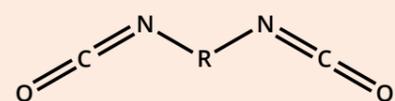


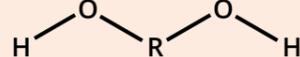
THE CHEMISTRY OF THE WORLD CUP BALL

POLYURETHANE COVERING

The surface covering of a football is composed of synthetic leather; in professional footballs, this is made from polyurethane polymers. The World Cup ball is made from six polyurethane panels, which are thermally bonded together. This covering protects the ball and minimises water absorption. In cheaper footballs, the coating can be made from PVC.

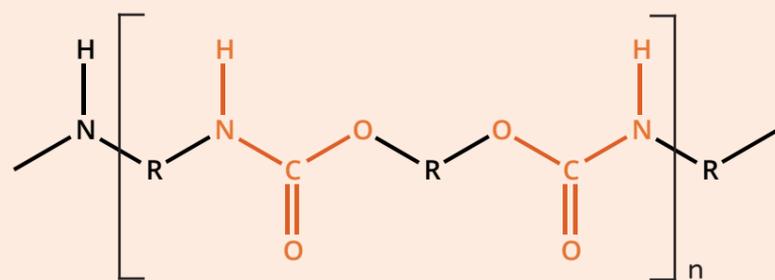


ISOCYANATE



POLYOL

R represents the portion of the organic molecule that can be varied depending on the specific polyurethane that is being synthesised.

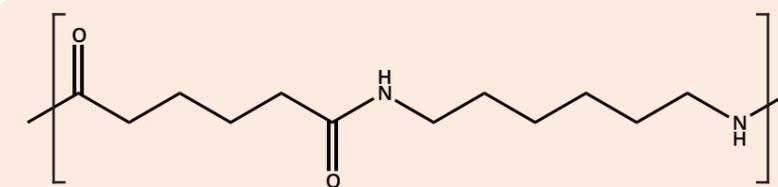


POLYURETHANE
(urethane linkages in orange)

Polyurethane is a polymer - a very large molecule built up from many smaller units bonded together. The basic synthesis of polyurethanes involves the addition reaction of isocyanate and polyol molecules to form urethane groups.

NYLON LINING

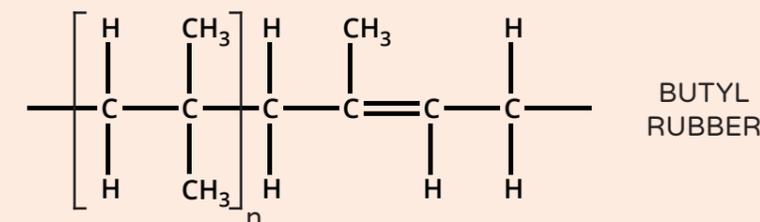
Several layers of lining are used between the covering of the football and the bladder to improve the bounce and strength of the ball. This lining is made of nylon, another class of polymers also known as polyamides. Polyesters can also be used for this purpose.



NYLON 6-6

BUTYL BLADDER

The bladder is the part of the ball in which the air is contained. Butyl rubber is often used because it retains the air better than the other option, latex. However, latex bladders can provide better surface tension.



BUTYL
RUBBER

