

# HYDRATED ADHESIVE GEL AND METHOD FOR PREPARING THE SAME

## BACKGROUND OF THE INVENTION

### Field of the Invention:

This invention relates to hydrated adhesive gels, especially hydrated adhesive gels for a self-adhesion cataplasm and pack agents having sheet shape. Related Art Statement:

Hitherto, in order to remove inflammation of muscles caused by a bruise, a sprain, etc., swelling, fever, etc., and to alleviate muscle pain, etc., it has been known to treat the affected part by a cold or hot compress.

In this case, stable moisture retention and viscoelasticity of the cataplasm are required without decreasing the water content in the hydrated adhesive gel (such as an ointment or plaster) by body heat, without losing adhesiveness due to drying, and without causing droop and surface tackiness due to moisture absorption and softening caused by sweating.

It is important that the hydrated adhesive gel itself have sufficient adhesion, and that a fixed means not be needed. Typically, in order to protect against slipping of the cataplasm caused by bending and stretching of an applied part of the cataplasm, a fixed means such as an adhesion sheet is required.

Such a self-adhesion cataplasm is disclosed, for example, in Japanese Patent Laid-open No. 58-21,613, and is obtained by blending acrylic ester copolymer emulsion with a base containing polyvinyl pyrrolidone which is crosslinked by methylvinyl ether/maleic anhydride copolymer to provide self-adhesion.

Further, according to the invention disclosed in Japanese Patent Laid-open No. 59-13,718, a compress agent having good adhesibility was obtained by adding dialdehyde starch into an aqueous acid solution of gelatin and polyacrylic acid, and adding a metallic salt or a metallic oxide thereto.

Moreover, in order to effect beauty treatment by removing dirt or keratin, and osmosing beauty ingredients such as vitamins or hormones, etc. into the skin, o/w type emulsions of an aqueous high-molecular compound such as polyvinyl alcohol or gelatinous film forming ingredients are commercially available as pack agents. These agents are used to effect beauty treatment by applying ingredients to the face, etc. to form a film, and peeling off the film or washing the face after drying.

These pack agents require a long time to dry, and sometimes need to be rapidly peeled, for example when a visitor suddenly comes. It is difficult to uniformly apply the hydrated adhesive gel such as an ointment or plaster to the skin, and when the dry film is stripped off, it tends to be torn. Another disadvantage is that beauty ingredients cannot be uniformly provided because of the nonuniformity of thickness. In order to avoid these disadvantages, a sheet pack agent produced by adding a crosslinking agent such as calcium chloride into an aqueous solution of polyacrylic acid to form a hydrous sheet gel, is applied to the face, etc. as taught in Japanese Patent Laid-open No. 58-180,408.

However, the said invention of Japanese Patent Laid-open No. 58-21,613 concerning the self-adhesion cataplasm teaches only blending acrylic ester copolymer emulsion as an adhesive into a base or crosslinked polyvinyl pyrrolidone. It has disadvantages in that the strength of adhesion is limited because there is no chem-

ical bonding between the base and the adhesive; moreover, the adhesion decreases with time.

Further, the self-adhesion cataplasm disclosed in Japanese Patent Laid-open No. 59-13,718 has good early adhesion. However, with evaporation of water, the adhesion lowers, and a particular disadvantage is that the adhesion is very low when reapplying the agents to the skin once the agents are peeled off.

Moreover, as the sheet pack agent, the method of Japanese Patent Laid-open No. 58-180,408 uses crosslinking hydrous gel obtained by adding a crosslinking agent into an aqueous solution of polyacrylic acid and/or a polyacrylate. In this case, as the crosslinking agent, metal salts such as calcium chloride, magnesium chloride, etc., compounds having at least 2 epoxy groups per molecule, such as polyethylene glycol diglycidyl ether, glycerine diglycidyl ether, etc., are taught.

However, when these compounds are used as crosslinking agents, the early adhesion of the cataplasm is good, but the adhesion is remarkably lowered when the sheet is reapplied on the skin after being peeled off (as with the self-adhesion cataplasm described in Japanese Patent Laid-open No. 59-13,718).

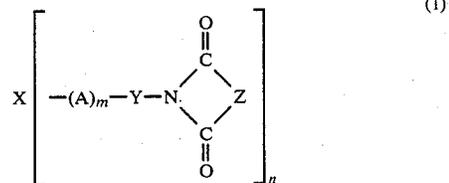
When compounds having at least 2 epoxy groups in a molecule are used, the reaction between the crosslinking agent and an aqueous solution of polyacrylic acid and/or a polyacrylate is very slow. Therefore, there are some faults, for example, the reaction needs high temperatures, e.g. 90° C., so that the beauty ingredients such as vitamins, etc. which are decomposable must typically be absorbed into the sheet of hydrous gel after formation of the gel.

## SUMMARY OF THE INVENTION

The present invention is directed to a hydrated adhesive gel comprising a reaction product obtained by adding an aqueous solution of an N-hydroxyimidoester compound into an aqueous solution of gelatin which contains a protein having amino groups at the side groups thereof and a gelling retarder such as calcium chloride, urea, etc., and partially bridging the protein. The products have very strong adhesion when wet.

Further, by substituting water in a hydrated adhesive gel such as an ointment or plaster for a hydrophilic tackifier such as glycerol, ethylene glycol, or polypropylene glycol which is liquid at ordinary temperatures, it is possible to avoid reduced adhesibility of said hydrated adhesive gel even if the water content is decreased during the use of an aqueous adhesive gel.

The present invention provides a hydrated adhesive gel comprising a product obtained by reacting an aqueous solution consisting essentially of protein having amino groups at the side chains thereof, and an N-hydroxyimidoester compound represented by the following formula (1):



wherein X is a residue of a compound having 2 to 6 carbons and 2 to 6 hydroxyl groups, A is at least one