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Development of Novel, Skin-Friendly Glycerol-Silicone Hybrid Adhesives

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Introduction

Within the field of advanced wound care, silicone adhesives are currently the preferred, state-of-the-art adhesive system due to their gentle skin adhesion properties¹. Silicone adhesives possess excellent oxygen permeability² but poor water transmission due to their inherent hydrophobicity. Here, we present a novel glycerol-silicone³ hybrid adhesive with improved fluid handling due to the incorporation of emulsified glycerol; improved permeability through the silicone layer due to the presence of glycerol; maintained adhesion during perspiration, as a results of improved fluid handling and permeability. Additionally, the adhesive performance is proved not compromised by the incorporation of glycerol.

Morphology of Adhesives

Glycerol domains incorporated in the silicone matrix characterized by confocal microscope. Upon crosslinking of the silicone phase, glycerol-silicone hybrid adhesives were obtained, with glycerol embedded in the polymer in the form of discrete droplets. We labeled each phase with different fluorescent color dyes and we analyzed the structure with confocal microscope. Morphology’s study showed that the higher is the glycerol loading, the more tightly packed the domains are and the thinner the spacing between them becomes.

Perspirations Experiments and Evaluation of Adhesive Performance

Peel Test on "Skin" Substrate

The water absorption is an effect of building up osmotic pressure. As water moves down its osmotic potential gradient, it starts to fill the glycerol domains embedded in the silicone.

References


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