Advanced Wound Care Adhesives with New Functional Properties

Chiaula, Valeria; Mazurek, Piotr; Nielsen, Anders Christian; Tornøe, Jens; Skov, Anne Ladegaard

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
**Advanced Wound Care Adhesives with New Functional Properties**

**Valeria Chiaula$^{1,2}$, Piotr Mazurek$^3$, Anders Christian Nielsen$^2$, Jens Tornøe$^2$, Anne Ladegaard Skov$^1$**

[1] Danish Polymer Centre, Department of Chemical and Biochemical Engineering, Technical University of Denmark, Saltofts Plads 227, 2800 Kgs. Lyngby, Denmark
[2] Coloplast A/S, Humlebæk, Denmark

**Introduction**

Wound healing is a dynamic process characterized by three overlapping cellular phases: inflammation, new tissue formation, and remodeling. Chronic wounds, which are often manifested in elderly and diabetic patients, result from anomalies in the cellular and molecular wound repair mechanism. Such wounds can lead to significant disability, amputation and increased mortality. The understanding of the normal wound healing mechanism and the consideration of the complexity of the wound environment, given by, e.g., hypoxia or bacterial infections, are crucial factors in order to develop an effective therapeutic approach$^{12}$. Here, we propose a novel, skin-friendly, industrially relevant silicone/glycerol hybrid adhesive with new functional properties, including: improved moisture handling due to the incorporation of emulsified glycerol and dispersion of active compounds by glycerol-embedding$^9$. This particular matrix paves the way for an innovative drug delivery system. Various parameters will be taken into account in order to develop a relevant adhesive, in particular glycerol content, glycerol domain size and adhesive thickness.

**Background**

**Wound Healing: 4 Cellular Phases**

- Bacterial infection
- Hyperproliferation: epidermal re-epithelialization
- Persistent inflammation
- Remodeling

**Chronic Wound Healing Process**

- Inflammation
- Hypoxia
- Extracellular matrix synthesis
- Epithelialization

**Focus: Appropriate Dressing for Appropriate Wound Environment**

- Impervious to water
- Impervious to bacteria
- Absorbent and leak proof
- Provides thermal insulation

**Development of Novel, Skin-Friendly Glycerol-Silicone Hybrid Adhesive**

Silicone Adhesives – Gentle Skin Adhesion Properties

- Improved moisture handling
- Incorporation of emulsified glycerol
- Release of active compounds
- Glycerol-incorporation of active compounds
- Beneficial skin care effects

**Experimental Work and Results**

**Release of Active Compounds: G20_SA and G40_SA Profiles**

**Stability and Morphology of the Emulsions: G20-SA as Example**

*Figure:* Glycerol domains incorporated in the silicone matrix characterized by optical microscope. The emulsions were investigated with respect to the stability during 60 min. Complete curing is known to occur after this time at room temperature and the systems can be assumed to be immobilized with no further changes expected. Specifically, we studied changes in size of the glycerol domains over this time period. Pictures refer to a) t = 0 and b) t = 60 min after the formation of the emulsions. The relative average glycerol domain sizes are shown. The results presented in Figure highlighted the stability of glycerol domains size over 60 min, since no changes were observed.

**References**


**Acknowledgment**

The authors gratefully acknowledge the financial support of the Innovation Fund Denmark.