ABSTRACT

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Title thesis: Rheological properties of silicone gels for scar treatment

The thesis is focused on testing of the flow and viscoelastic properties of the scar treatment silicone-based gels, either commercially available or newly formulated gels under development. The theoretical part deals with the scar formation, silicone in scar treatment, and characterization of the gels. In the experimental part, rotational and oscillation tests were performed using a rotational rheometer. The obtained flow curves were fitted by Newton or Power law models. The shear viscosity, coefficient of consistency, and index of flow behaviour were used for gel characterization and comparison. The highest viscosity revealed in the ScarEsthetique cream, followed by RejuvaSil gel. Surprisingly, the Stratamed scar gel and Scar gel Dr. Max showed the lowest viscosity, even lower than the formulations at the development stage. Despite the name "gel", they behave as Newtonian fluids. The elastic modulus G', viscous modulus G", and complex modulus G*, phase angle δ, the gel point, and linear viscoelastic region LVER were selected to describe the viscoelastic behaviour of the tested products. The only viscoelastic solids with a bicoherent 3D gel structure are the RejuvaSil gel and ScarEsthetique cream. Stratamed and Scar gel Dr. Max, and also the formulated gels are viscoelastic fluids. ScarEsthetique cream has the highest stiffness, with the value of complex modulus approximately 5000 Pa. The Rejuvassil gel follows with an order of magnitude lower stiffness. Formulations characterized as viscoelastic fluids have a G* values ranging from approximately 10 Pa to around 70 Pa.

Keywords: silicon; gel; scar treatment; flow behaviour; oscillation test; viscoelasticity.