Observation of Varying Stratum Corneum Behavior with Atmospheric Microplasma

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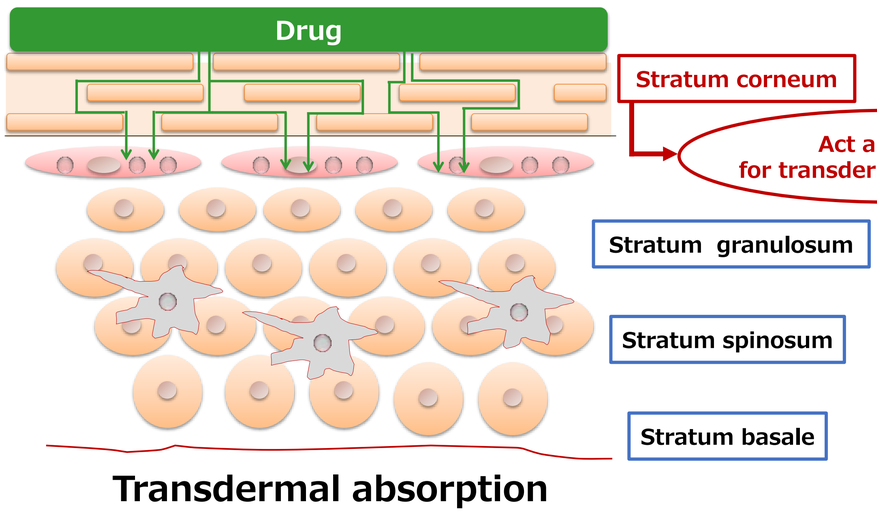
Medical applications with atmospheric plasma have been studied in recent years. Ions and active species generated by atmospheric plasma are used for the applications such as inactivation of cancer cells, nitric oxide inhalation and sterilization. Dermatology is one of the application fields. Wound healing, skin rejuvenation and treatment of wrinkles also have been studied.

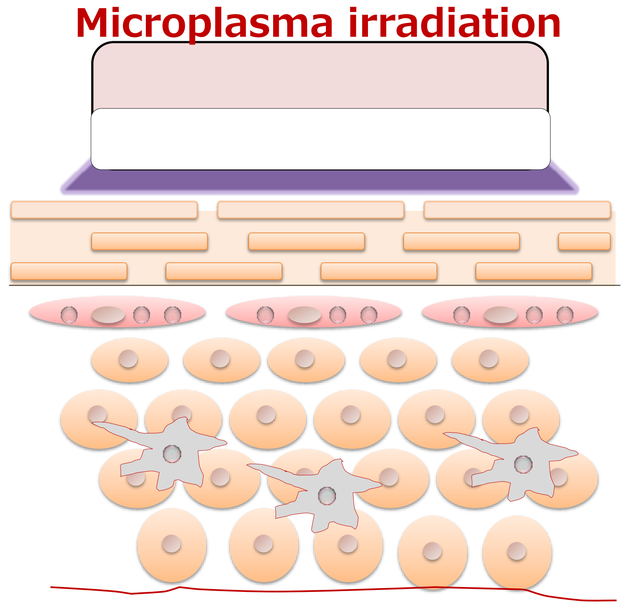
In this study, it was investigated whether the atmospheric microplasma can be applied to the drug penetration through skin (transdermal absorption) process. The effect of the atmospheric microplasma was evaluated by irradiating to stratum corneum (SC) sample and ATR methods.

1. Objectives



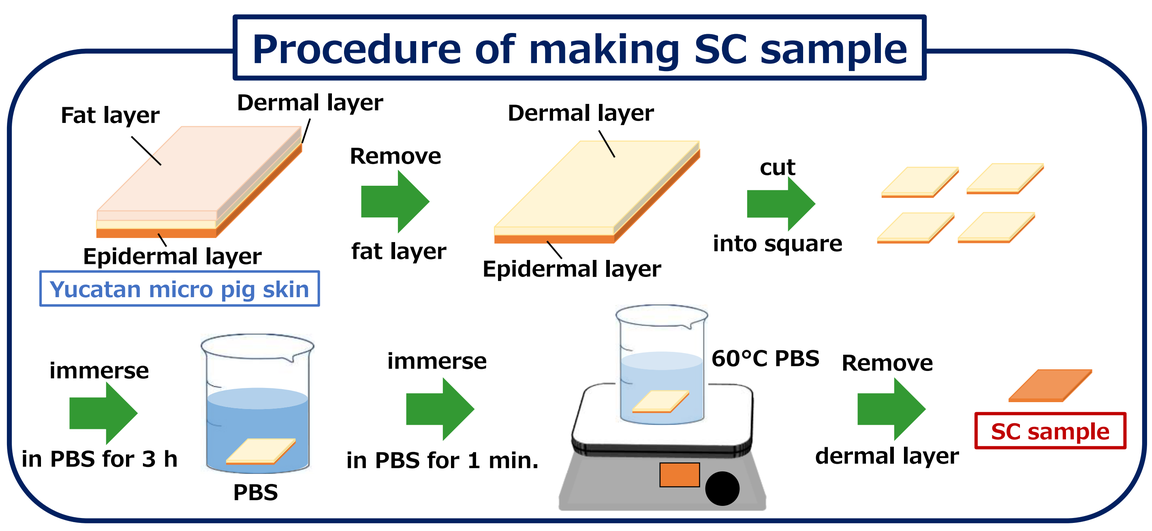
To enhance

transdermal absorption

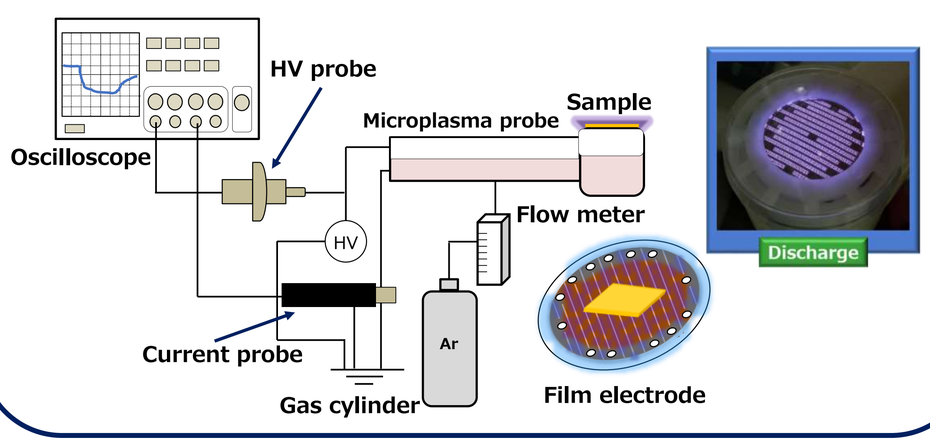


2. Sample & Methods

Procedure of making SC sample

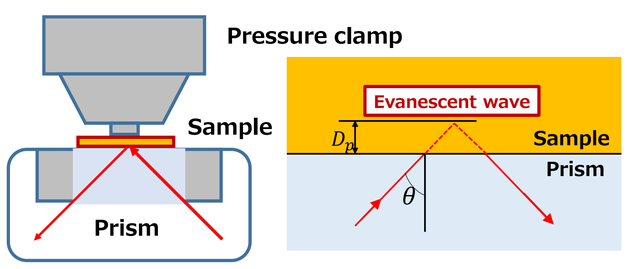


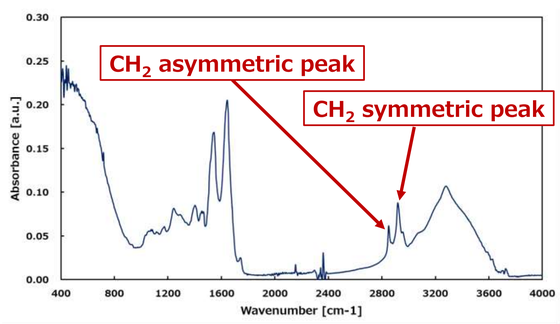
Microplasma irradiation to SC sample



Analysis with ATR method

ATR: Attenuated Total Reflection





Obtain a spectrum of SC sample

Experimental condition

Microplasma irradiation

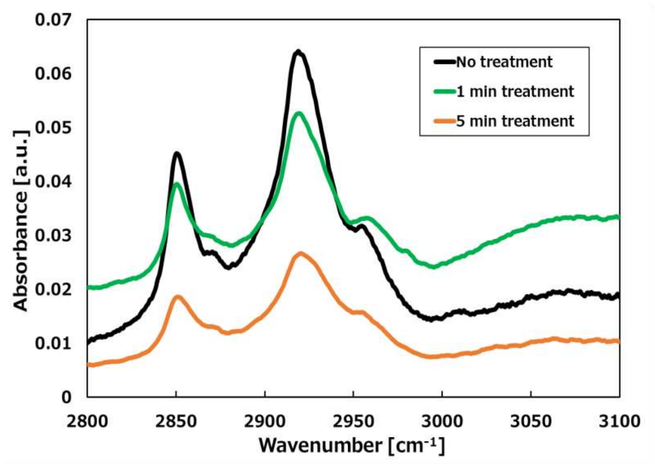
Power supply	Negative pulse
Applied voltage [V]	975
Frequency [kHz]	10
Pulse width [μs]	5.0
Exposure time [min]	1, 5
Flow rate [L/min]	5.0
Process gas	Argon

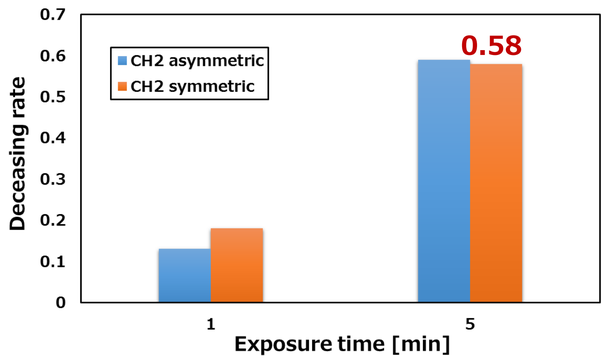
ATR measurement

Prism	Diamond
Wavenumber band [cm^{-1}]	2800 ~ 3100
Resolution [cm^{-1}]	1.0
Cumulated number	64

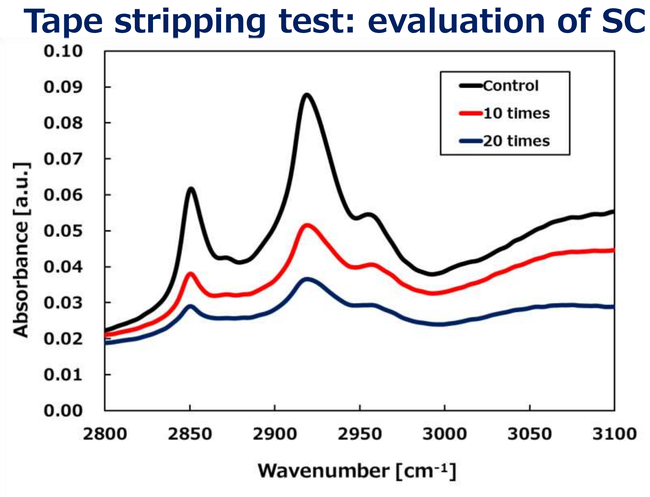
3. Results and Discussion

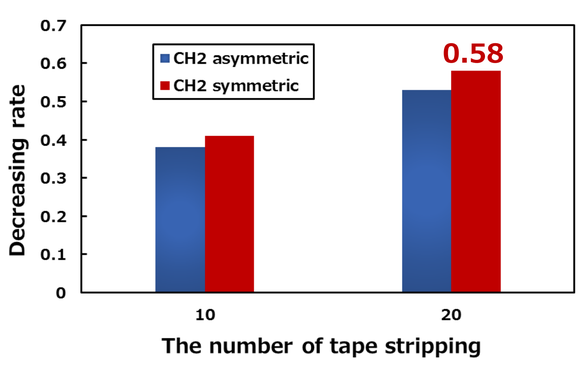
Result of microplasma irradiation





Tape stripping test: evaluation of SC





Microplasma irradiation to SC sample

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CH_2 peak absorbance was decreased

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Decrease of SC layer thickness could be considered

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Enhancement of drug penetration through a skin

4. Conclusions

- The absorbance of the porcine skin sample was decreased as the exposure time was increased.
- After 5 min irradiation, a definitive decrease of the absorbance was confirmed.
- In comparison to the result of tape stripping test, SC layer could be decreased by the atmospheric microplasma irradiation. This result is expected to enhance the drug penetration through the skin.