Temperature characterization of nanoparticles-doped fiber in the context of Transmission-Reflection Analysis (TRA).

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Temperature sensitivity

Average power on every 1-hour long plateau was calculated between 20°C and 250°C. We estimate the sensitivity to be 150 nW/°C from 20°C to 100°C and 85 nW/°C from 100°C to 250°C which represents less than 2% of the transmitted power.



When the temperature increases, the shape of the absorption band changes, its bandwidth increases. At higher temperature, the overlap between the SLED emission band and the erbium absorption band increases, leading to a lower transmitted power.

Conclusion and Outlook

By comparing transmitted and reflected powers of SMF, EDF and NPF, it appears that EDF and NPF are both temperature sensitive contrary to SMF. The common point between these two fibers is the presence of Erbium inside the core. It could be the sensitive element of these fibers. We also calculated an estimation of NPF temperature sensitivity. There is a nonlinear response of transmitted power depending on temperature. The sensitivity is higher for 20°C to 100°C and 1.7 times lower for 100°C to 250°C. But considering strain sensors based on TRA, we conclude that temperature variations will have a minimal impact on the measurements.

Outlook

- Proceeding strain measurement in high temperature environment.
- Decoupling power variations caused by temperature and stress changes.

References

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Transmitted power of NPF depending on temperature.