



CF/MODIFIED-PEEK COMPOSITES FOR AIRCRAFT

T. HAYASHI* and T. ISHIKAWA,

Advanced Moldings and Composites Laboratory, Mitsubishi Chemical Corporation.

*hayashi.takahiro.mx@m-chemical.co.jp

Introduction

- Advanced thermoplastic composites are promising material for aerospace industries.
 - impact resistance^[1,2]
 - Molding (Automated laying, rapid thermoforming)
 - Weldability
- Some modified-PEEK(polyetheretherketone) resins were developed by chemical companies and institutes^[3].
 - PEKK (polyetherketoneketone)
 - High T_g PAEK (polyaryletherketone)
 - Low T_m PAEK
- We have developed a unique modified-PEEK by adding high T_g polymers to PEEK, and its resin based composite.

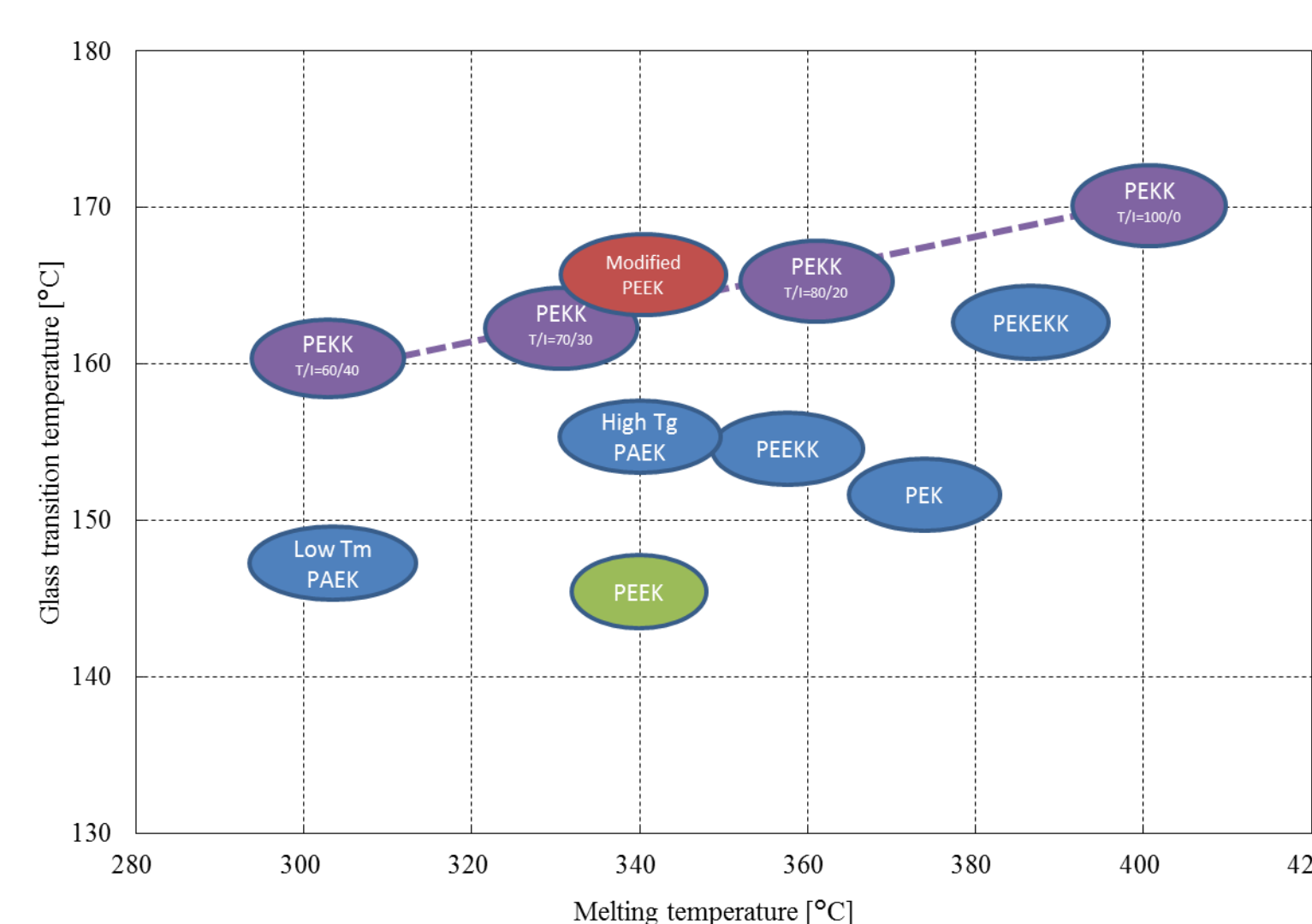


Figure : Relationship between T_g and T_m of some thermoplastic polymers, including developed modified-PEEK in this study.

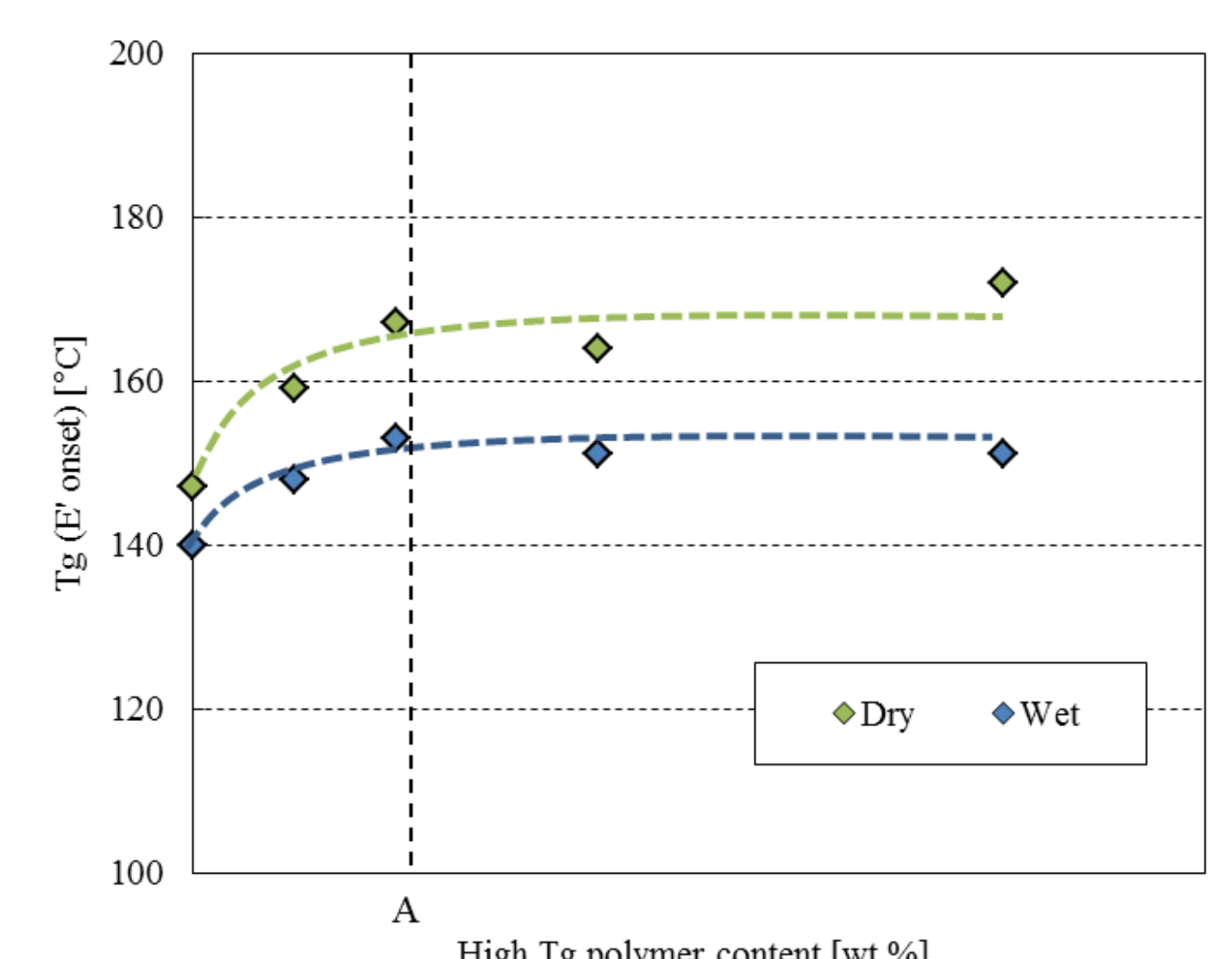


Figure : Relationship between the content of high T_g polymers in modified-PEEK and DMA- T_g of the composites, where wet condition is soaking in 70°C water in 2 weeks.

Temperature dependence of transverse strength

- the flexural strength of the PEEK composite decreased to 80% compared with the strength at room temperature.
- On the other hand, the flexural strength of the modified-PEEK composite decreased to 90%.

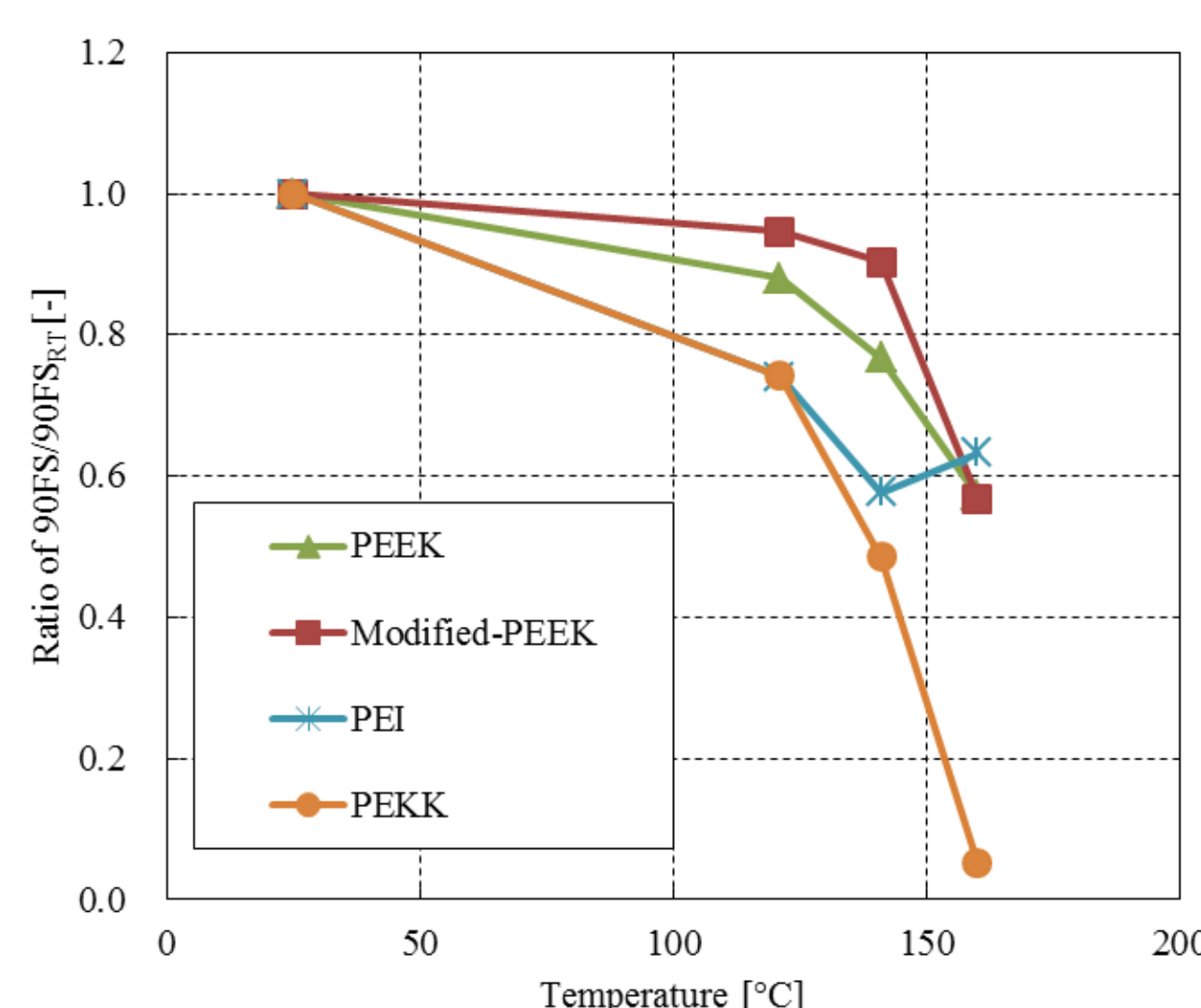


Figure : Temperature dependence of transverse flexural strength (90FS) of thermoplastic composites, normalized by the strength of each composite at room temperature.

Mechanical properties; CAI, OHC.

- the decrease of strength was within 10% to PEEK based composite, the mechanical properties of the modified-PEEK composite show high level.

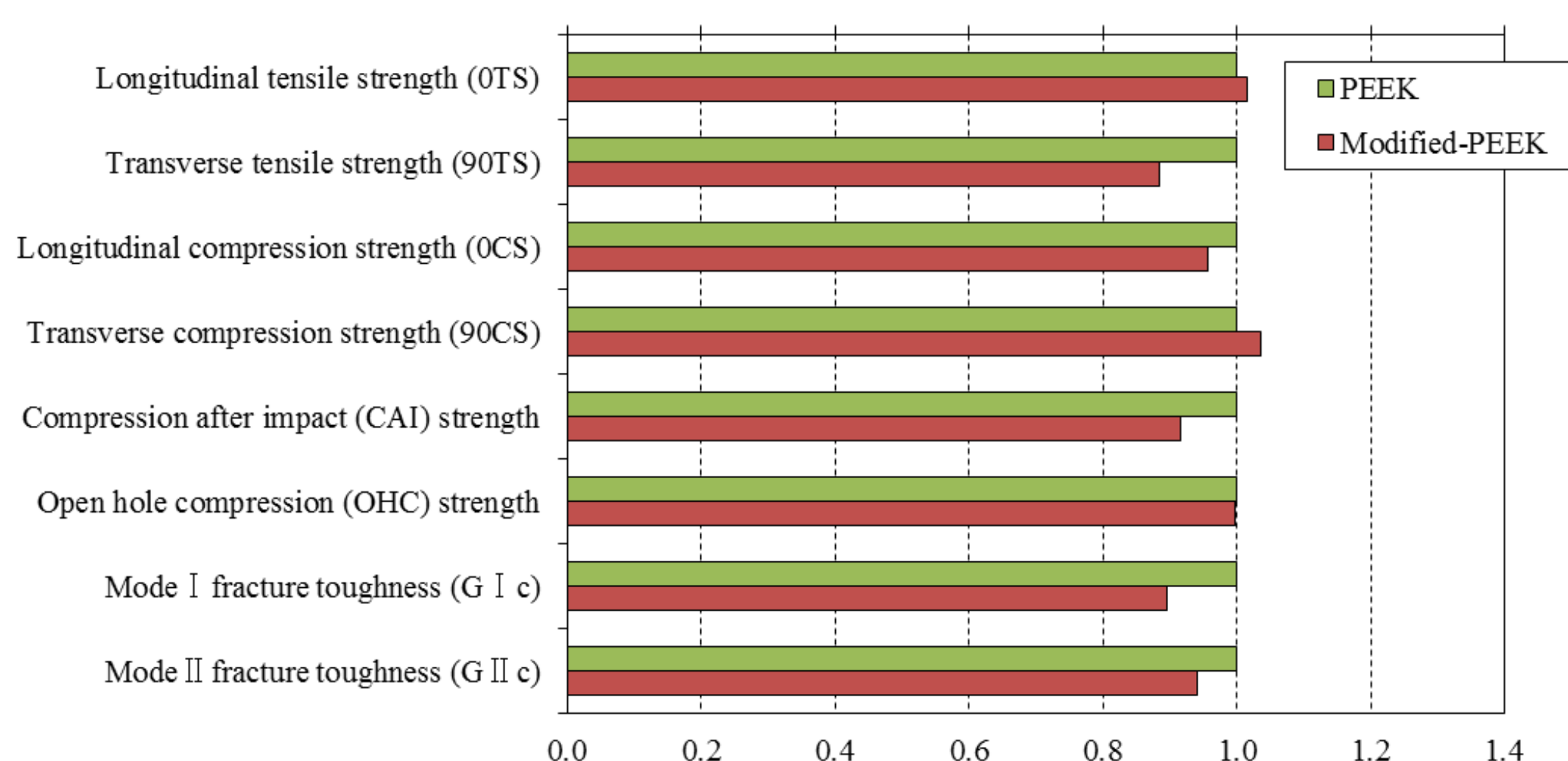


Figure : Comparison of mechanical properties of the PEEK and the modified-PEEK based composites, each property is normalized by that of PEEK based composite.

Flammability; OSU heat release rate

- Flammability of the modified-PEEK composites showed almost equivalent as PEEK and PEI composites, and has higher flame retardance than PPS and thermosetting composites.

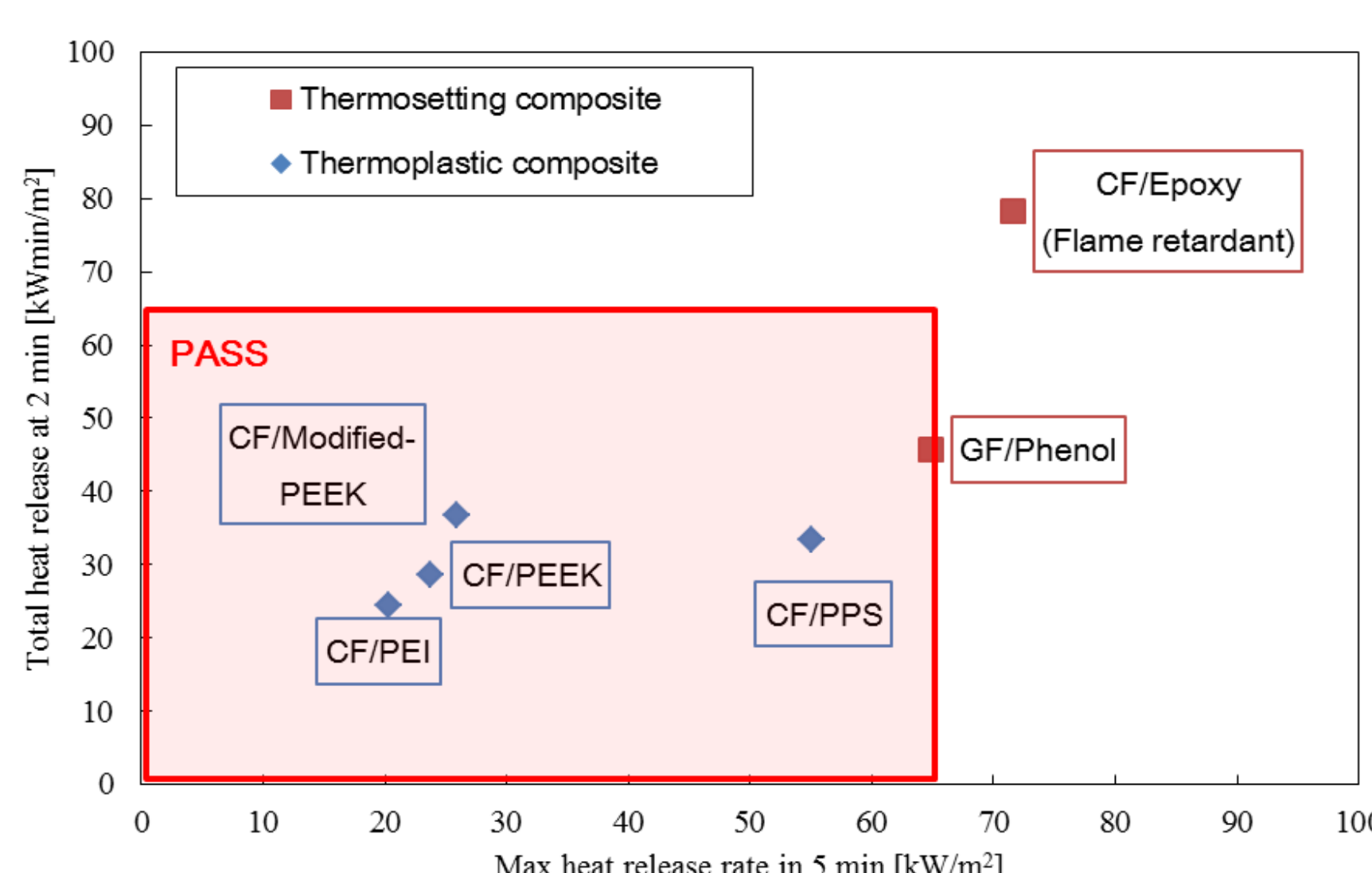


Figure : Maximum heat release rate during fire test and total heat release at two minutes of thermoplastic and thermosetting composites (Left), A fire instrument for OSU-HRR (Right).

Conclusions and references

- These results indicated that the modified-PEEK composites will be acceptable for aerospace structural components.
 - Transverse flexural strength of the modified-PEEK composite decrease to 90% around 140°C, compared with the strength at room temperature.
 - The modified-PEEK based composite has 90% of CAI strength and almost same OHC strength, compared with PEEK based composite.
 - The modified PEEK composite can pass the FAR fire test. The heat release rate and the total heat release from the composite showed almost equivalent as PEEK and PEI composites and lower than PPS composites.