

## Low-CTE and Low-CHE Poly(ester imide)s

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Polyimides (PIs) are utilized for a substrate in the flexible printed circuit (FPC). A low-CTE polyimide is commercialized as a substrate in the adhesive-free flexible copper clad laminates (FCCL). However, it is not enough for water absorption in the current commercial PI films. In this work, we developed novel poly(ester imide)s (PEsI) for FCCL, which possess a low CTE (linear coefficient of thermal expansion), high toughness, high modulus, high T<sub>g</sub>, low water absorption, and low CHE (coefficient of humidity expansion) simultaneously. A new type of poly(ester imide)s (PEsI) was prepared from an ester-containing dianhydride with a novel ester-containing diamines (70 mol %) and 4,4'-oxydianiline (30 mol %) as a comonomer. Our PEsI films achieved the current target properties for practical applications to FPC, namely, a low CTE (= 10 ppm/K), low water absorption (0.35 %), and high toughness (elongation at break > 50%). A good correlation was observed between the imide content in the structure and water absorption, suggesting a possibility of further decreases in water absorption and CHE without sacrificing other required properties. We also investigated how some substituents on the diamines and dianhydrides influence the film properties and found that they play a great role for decreasing crystallinity, as a result, for improving significantly the film toughness.

### References

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