**ENHANCEMENT OF POLYPROPYLENE AND HOLLOW GLASS MICROSPHERES COMPOSITES’ PERFORMANCE VIA ADDITION OF COMPATIBILIZING AGENTS**

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**Abstract:**

Thermally insulated subsea pipelines play a key role for hydrocarbon production and transportation. Among available solutions, composites of polypropylene and hollow glass microspheres highlight as the most used solution in the industry. The continuous and the disperse phases of the material, however, show low interaction levels due to poor chemical compatibility between the matrix and the fillers. In summary, the material may fail when submitted to mechanical loads as consequence of poor load transfer between phases and propagation of microscopic flaws within the matrix.

Different approaches have been used to enhance the interaction between continuous and disperse phases. This essay approaches two strategies which are considered suitable for short to medium-term implementation in the industry: the use of compatibilizing agents and the substitution of the polypropylene matrix by a less stiff or more flexible heterophasic polypropylene matrix. The technical effectiveness of selected strategies was assessed through mechanical stress-strain tests, evaluation of absorbed water during water immersion, and evaluation of thermal properties. Composites with polypropylene and heterophasic polypropylene matrices, 25% by weight of hollow glass microspheres, and contents of poly(propylene-g-maleic anhydride) and ethylene-acrylic ester-glycidyl methacrylate terpolymer compatibilizing agents spanning from 1% to 5% by weight were prepared and tested. The addition of compatibilizers improved the mechanical strength by increasing tensile strength by 9% to 30%, although reducing the elongation at break by 13% to 45%. Differential scanning calorimetry and dynamic-mechanical analyses indicated no significant influence of compatibilizers on melting points, crystallization temperatures and glass transition temperatures. Water absorption assessments indicated opposite effects of each compatibilizer in absorbed water content. After all, the main observations were ratified through scanning electronic microscopy assessments.

**Biography of presenting author**

Mr. Haverroth graduated as Mechanical Engineer at the Federal University of Santa Catarina, Brazil, in 2007. He then joined the subsea pipeline engineering team at Petróleo Brasileiro S.A. (PETROBRAS) and occupies the position of Consultant in Application of Polymers in Subsea Pipelines since 2012. He obtained an MBA degree in Project Management in 2015 and a graduate degree in Processing of Plastics and Rubbers in 2017, both at Federal University of Rio de Janeiro, Brazil. He received his MSc. degree in Science and Technology of Polymers at the same institution in 2019.

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