Tribological Performance of PTFE + Taillings of Scheelite Composites

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1. Introduction

The northeastern backlands was for decades the largest producer of concentrate scheelite (tungsten ore-mineral) in Brazil. As a result of mining highlights the deposition of tailings stored in the open, leading to a strong environmental liability. Aiming to study alternatives and enable reuse of scheelitas, composites were developed using polytetrafluoroethylene (PTFE) and the taillings of scheelita (TJ).

The tribological performance of the composites was performed by scratch resistance, measuring the strain energy for each composition. Scratch is a score or mark into the surface of a material with a sharp tool (30° tip angle) called indenter. This damage mechanism occurs frequently on surface of PTFE parts submitted to sliding systems. Petrochemistry, bioengineering and aerospace industries use materials based on PTFE (polytetrafluoroethylene) nanocomposites in order to reducing operating costs and energy because they provide low friction coefficients ($0.01<\mu<0.1$) despite its high wear rates (greater than 10^{-13} m^2/N).

2. Experimental Procedure

For the development of composites a commercial PTFE and Taillings of Scheelite (TJ) were used in powder form, which were mechanically mixed and compressed at a pressure of 15,000 lbf for 3 minutes. The samples had the following compositions: PTFE / RX (100/0), PTFE / TJ (85/15), PTFE / TJ (75/25), PTFE / TJ (65/35), PTFE / TJ (50/50) wt%.

The scratch resistance tests were conducted using an indenter with a point angle of 30°. The method is a tribological technique that consists in printing a pendulum movement on a conical tip indenter from a height H to reaching the body of the test with a abrasive risk single.

After the tests the samples were analyzed by scanning electron microscopy to identify the wear mechanisms occurring and the results of strain energy, energy needed to promote risk, were compared to verify the effect of Taillings of Scheelite from the viewpoint tribological.

3. Results

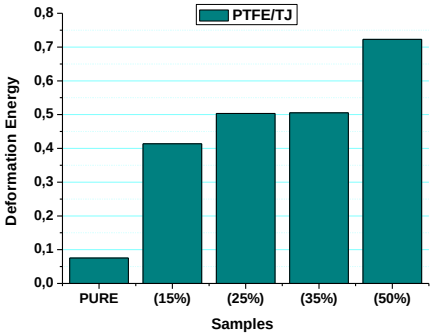

Figure 1: Deformation Energy of Studied Composites.

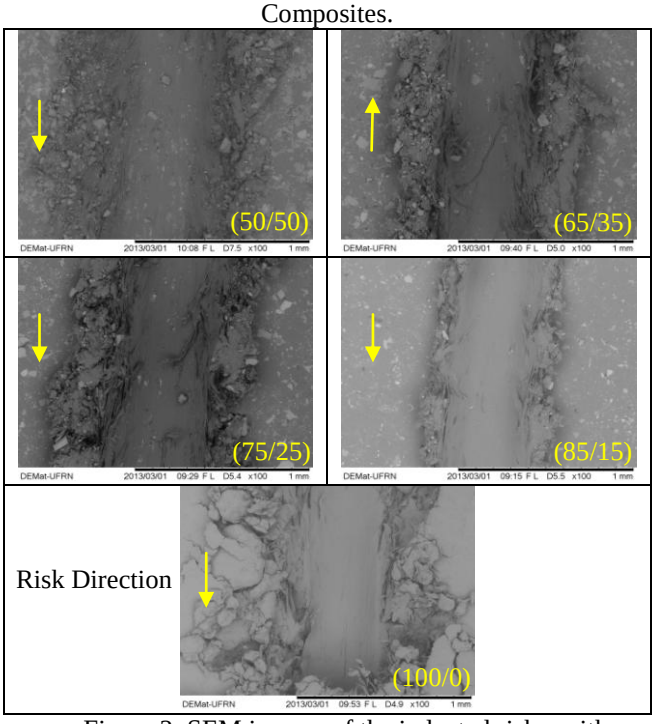

Figure 2: SEM images of the indented risks, with angle of 30° for the studied composites (PTFE/TJ).

4. References

[1] Briscoe, B. J.; Isolated contact stress deformations of polymers: the basis for interpreting polymer tribology. Tribology Internacional, v. 31, (1-3), 1998, 6-121;

[2] Sinha S. K., Lim D.B.J.; Effects of normal load on single-pass scratching of polymer surfaces. Wear 260, 2006, 751–765;