Jožef Stefan Institute, Ljubljana, Slovenia

Jamova cesta 39, SI - 1001 Ljubljana, Slovenia / www.ijs.si

Tel.: +386 1 477 3900 / Fax: +386 1 453 5400

Center for technology transfer and innovation
Tel.: +386 1 477 3224, Fax.: +386 1 423 54 00; e-mail: tehnologije@ijs.si

TECHNOLOGY OFFER

METHOD REDUCING FRICTION OF PVDF AND PVDF- BASED COATINGS FOR 70 %

An innovative method provides three-dimensional and thin film morphologies of fluoro-polymer nanocomposites wich reduce friction coefficient of PVDF or PVDF-based coatings for 70%.

Technology field: Self-lubricative coatings, protective barrier coatings, nanomaterials, low friction coefficient.

The problem:
Polyvinylidene fluoride (PVDF) is a highly non-reactive thermoplastic fluoro-polymer with a high thermal stability up to 175 °C. It is usable in a wide range of applications that depend on its particular phase of crystallization, such as piping products, insulators for premium wires, binder material for composite electrodes for lithium ion batteries, membranes in biomedicine, components for the pharmaceutical and food processing industry, as piezoelectric and pyroelectric materials, etc. In many mentioned applications the important parameter is friction coefficient of the material.
PVDF has a relatively **high PVDF-PVDF coefficient of friction** in the range 0.25-0.45 which also limits its application as friction-intensive or self-lubricative coatings or as protective barrier coatings.

The solution

The high friction characteristic of PVDF can be solved by a method for adjusting the friction coefficient of PVDF and PVDF-based polymers by incorporation of MoS_2. Standard use of MoS_2 platelets as additive for friction reduction and recent discoveries of new morphologies of MoS_2 have opened the route to prepare new PVDF-based nanocomposite films containing MoS_2 nanotubes or exfoliated MoS_2 nanotubes for self-lubricative and protective barrier coatings.
By our solution the friction coefficient can be reduced up to 70 %.

Advantages

Significantly reduce friction.
Improved wear behaviour in the boundary-lubrication conditions between metal counterparts.

Jožef Stefan Institute, Ljubljana, Slovenia

Jamova cesta 39, SI - 1001 Ljubljana, Slovenia / www.ijs.si

Tel.: +386 1 477 3900 / Fax: +386 1 453 5400

With the method according to the invention, the MoS_2 nanotube-based nanomaterials are added to PVDF in the form of a solution in an appropriate solvent or to PVDF in a melted form, and further homogenized by mechanical stirring.

Friction tests were performed in a flat- on-flat geometry for PVDF/MoS_2 nanocomposite films with 0 %, 1 wt.% and 2 wt.% of MoS_2 nanotubes. The results are represented in a Figure below.

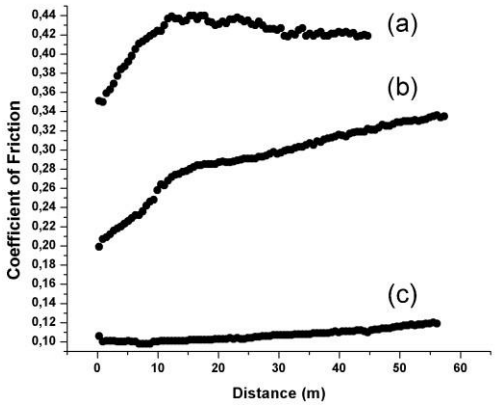

Figure shows results of friction tests in a flat-on-flat geometry for PVDF/MoS_2 nanocomposite films with (a) 0 wt. %; (b) 1 wt.%, and (c) 2 wt.% of MoS_2 nanotubes

The 1 wt.% of MoS_2 nanotubes in PVDF reduced friction by more than 20 % with regard to pure PVDF. The 2 wt.% of MoS_2 nanotubes in PVDF reduced friction by more than 70 %.

Stage of development

The technology has been demonstrated and tested in laboratory. Technology is ready to be licenced out.

Target sectors for commercialization/applications

Producers of self-lubricant coating or protective barrier coatings.
Producers of PVDF.

Intellectual property

Patent filed.

CONTACT DETAILS

Center for Technology Transfer and Innovation,
Jozef Stefan Institute,
Jamova cesta 39, SI-1000 Ljubljana
http://tehnologije.ijs.si
tehnologije@ijs.si

