

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

### Fields of use

Self-lubricative coatings, protective barrier coatings, nanomaterials, low friction coefficient

### Current state of technology

Demonstrated and tested in laboratory. Ready to be licenced out.

### Type of cooperation

License agreement

### Intellectual property

Patent filed

### Developed by

Jožef Stefan Institute

### Contact

Center for Technology Transfer and Innovation

Phone: + 386 1 47 73 224

E-mail: [tehnologije@ijs.si](mailto:tehnologije@ijs.si)

Web site: <http://tehnologije.ijs.si/>

More information about the invention



### Summary

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

### Description of the invention

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:

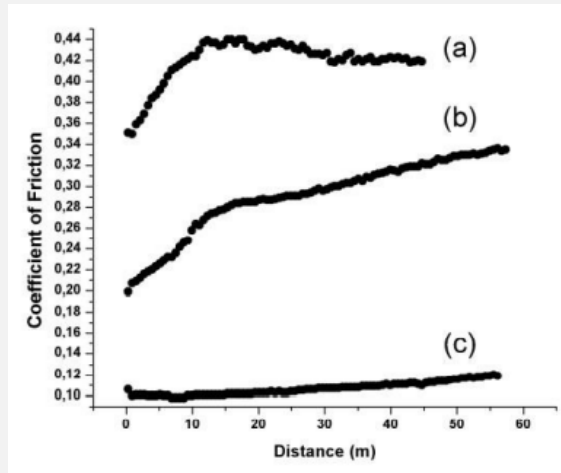
The high friction characteristic of PVDF can be solved by a method for adjusting the friction coefficient of PVDF and PVDF-based polymers by incorporation of MoS<sub>2</sub>. Standard use of MoS<sub>2</sub> platelets as additive for friction reduction and recent discoveries of new morphologies of MoS<sub>2</sub> have opened the route to prepare new PVDF-based nanocomposite films containing MoS<sub>2</sub> nanotubes or exfoliated MoS<sub>2</sub> nanotubes for self-lubricative and protective barrier coatings.

By our solution the friction coefficient can be reduced up to 70 %.

With the method according to the invention, the MoS<sub>2</sub> 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<sub>2</sub> nanocomposite films with 0 wt.% (a), 1 wt.% (b) and 2 wt.% (c) of MoS<sub>2</sub> nanotubes as represented in a Figure below. The 1 wt.% of MoS<sub>2</sub> nanotubes in PVDF reduced friction by more than 20 % with regard to pure PVDF. The 2 wt.% of MoS<sub>2</sub> nanotubes in PVDF reduced friction by more than 70 %.



### Main Advantages

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

### Partner Sought

Specific area of activity of the partner: Producers of self-lubricant coating or protective barrier coatings. Producers of PVDF.

Task to be performed of the partner sought: Technology is ready to be licenced out.