Field of the Invention:

The invention is the coating of textile machinery parts using Aluminum Magnesium Boride - AlMgB1 -BAM and thin layer deposition methods as vacuum magnetron sputtering,... BAM has lowest friction, third hardness after diamond and boron nitride and so enhanced durability, wear resistance; with a tenth of the cost of current diamond coat, used on the thread contact in thread guides, drawing rollers, spinning parts, knitting needles,…and without carbon diffusion problems into iron-carbon matrix. BAM is antimicrobial and corrosion protection.

Classification: C23C 30/005: Focuses on coatings composed of alloys based on aluminum with magnesium as the next major constituent, aligning with the chemical composition of BAM.

Background of the Invention:

In the textile industry, machinery components such as cutting blades, spinning parts, thread guides, and drawing rolls are subjected to high levels of wear and friction. Traditional materials and coatings, specially diamond coating, often fail to provide the necessary durability and performance, leading to frequent maintenance and replacements. BAM (AlMgB14) is known for its exceptional hardness (third after diamond and boron nitride, alternatives 10 times more expensive), loweste friction coefficient, and high wear resistance, making it an ideal coating material for these applications. BAM is as slippery as it is strong, with a coefficient of friction of 0.02, making it substantially slicker than Teflon (0.05) and lubricated steel (0.16). Applying BAM to textile machinery components can significantly enhance their efficiency and lifespan. Other patents using BAM include the Gillette razor BAM coated (WO2013022668A1), that is the same coating, affecting the textile machinery friction components instead of a razor blade.

It would be desirable to optimize textile machine coatings and/or steps required cost for the textile production, while maintaining or improving the machine performance.

For instance, baseline BAM material may typically display microhardness of about 32 GPa to about 35 GPa, but additions such as titanium diboride (TiB2) may increase the microhardness to about 45 GPa producing one of the hardest known bulk materials. BAM materials have demonstrated some of the lowest coefficients of friction of currently known solids, (e.g., less than 0.05 and as low as about 0.02), while Teflon (PTFE) is in the range of 0.05 to about 0.10.

BAM coatings will generally be both hard and low friction (e.g., slippery), they may desirably provide a single coating solution for edges, as BAM has a very good adhesion profile. The need for a soft lubricious overcoat layer and/or other inter-layers such as adhesion layers or the like, may or may not be sought-after, depending on desired attributes and characteristics of applied BAM coating. Not having additional layers, potentially eliminates required processing steps of those layers (e.g., spray & sinter, telomer thinning), resulting in simplified manufacturing.