PROJECT PROPOSAL FOR CONSIDERATION UNDER IUR CERTIFICATION

NANO-FINISH FORMULATIONS FOR HIGH PERFORMANCE LEATHERS

SUBMITTED BY

Dr. SANJEEV GUPTA M.Tech, Ph.D
CHIEF SCIENTIST

CLRI Central Leather Research Institute
Council of Scientific and Industrial Research

NANO-FINISH FORMULATIONS FOR HIGH PERFORMANCE LEATHERS

INTRODUCTION:

Nanotechnology is one of the main drivers of technology in this century and holds the promise of higher performance materials, intelligent systems and new production methods with a significant impact on all aspects of society. Recently increasing interests has been directed towards incorporating nanotechnologies into leather. They offer cost-effective improvements in leather performance. The change in properties of materials is due to increased surface area to volume ratio. Reactions take place at the surface of a chemical or material; the greater the surface for the same volume, the greater the reactivity. The link to nanotechnology is that as particles get smaller their surface area to volume ratio increases dramatically.

Nano coating is ideal for leather garments, leather goods, furniture, car seats, and footwear leather. It is ecologically beneficial, biologically safe, and breathable with low cleaning/maintenance. Chemical bonding between the nano particles and leather surface provides durability and high performance. Furniture upholstery must be resistant to stains and the effects of continual bright sunlight. Leather for car upholstery needs light fastness, resistance against UV radiation and a high degree of rub fastness properties which can be achieved by incorporating suitable metal nano particles in finishing formulations. The primary aim of this project is to combine the fields of Leather technology and Nanotechnology to attain superior quality of leather with high performance.

Reason for Research:

The project aims to develop a leather coating by incorporating functional nanoparticles to form a layer providing properties such as Abrasion, Scratch and UV resistance. The coating should also offer resistance to wear and other organoleptic properties.

S.NO	CONVENTIONAL FINISHING SYSTEM	NANO FINISHING SYSTEM
1	Low surface area to volume ratio.	Large surface area to volume ratio
2	Only few reactive sites	More reactive sites
3	More chemicals should be added in the season to attain the desired physical properties.	Only a small amount of nano particles is added in the season to attain physical properties.
4	Can attain only one property.	Can attain more than one physical property using the same nanoparticles in the season.

Hypothesis:

To develop a novel nano finish formulation for a flexible substrate like leather with multi-functional properties. The metal oxide nanoparticles embedded in leather coating formulations will exhibit enhanced Wet & Dry rubs fastness, light fastness and UV resistance. These coatings will also provide properties such as Scratch resistance, Abrasion resistance, Light fastness etc., for high end leather applications like Automobile upholstery, High performance upper leather, etc.

Equipment and materials:

Facilities in CLRI institute will be used and extra equipments may be procured at later stage.

Outline of procedure:

Synthesis– Zinc Oxide (ZnO) and alumina nanoparticles will be synthesized by Sol-Gel method and Precipitation method. Synthesis of Polymer Nanocomposites like POSS will also be attempted for leather finishing applications.

Characterization: These nanoparticles will be characterized by using SEM, XRD, UV, TEM, NMR, AFM and FT-IR for the confirmation of particle size and morphology (Shape, Crystallinity, Grain Size, Functional groups etc).

Dispersion: These nanoparticles will be dispersed suitably and mixed with the conventional leather coating ingredients.

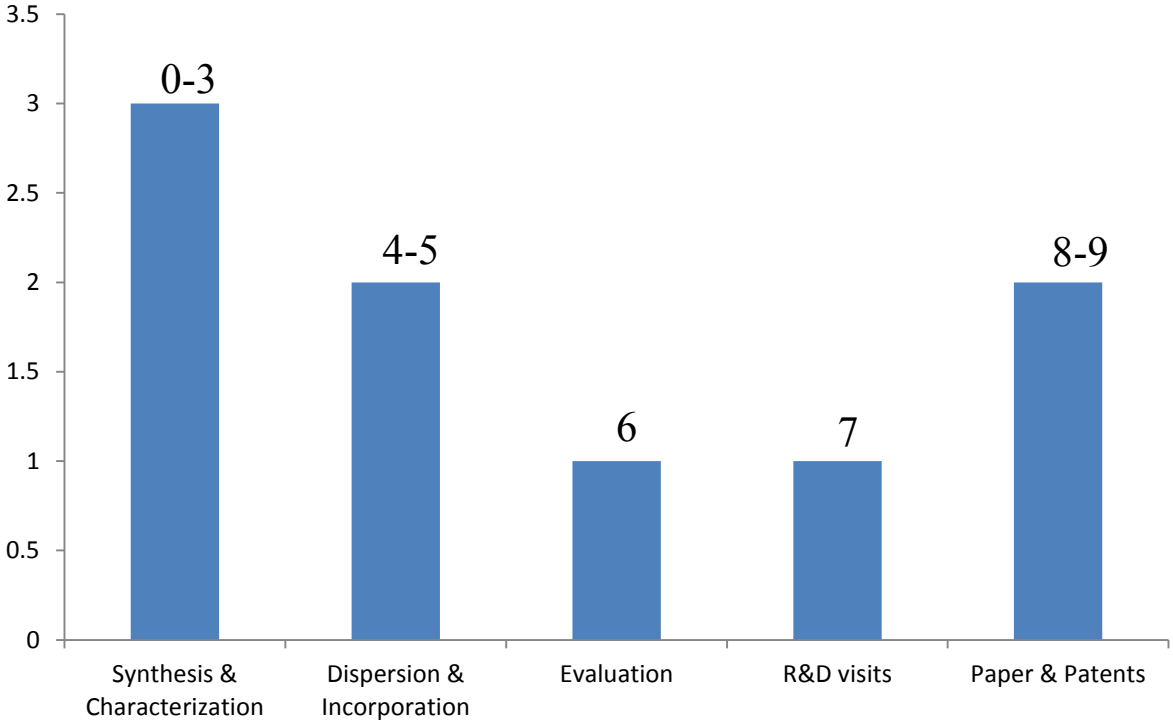
Leather Coating: The nanomaterial will be mixed with the season and Top Coat formulations can be applied on the surface by Spray coater.

Evaluation: The coated leathers will be tested for their physical and other properties to judge the efficacy of the coating materials.

Envisaged Plan:

- Collaboration with R&D and other centres that work in similar areas.
- Exchange of visits of persons involved in the project for updating and sharing their knowledge.
- Explore the possibilities of International funding.

Estimated Project Duration (to be extended as per progress and use of new materials):



Step 1: Synthesis and Characterization of Nanoparticles (Material I, Material II and Material III).

Step 2: Dispersion and Incorporation of nanoparticles in leather season.

Step 3: Evaluation of Organoleptic properties.

Step 4: Exchange of Visits for R&D (Large scale trials) & Report preparation.

Step 5: Preparation of Paper/Patent from the obtained results.

EXPECTED OUTCOME:

- Novel Nano formulation imparting Multi-functional properties.

- Development of leather having multi-functional properties such as Abrasion resistance , Increased Wet and Dry Rub Fastness, Light fastness, Colour fastness to water.