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3. **NAME OD DEPARTMENT**: MECHANICAL ENGINEERING
4. **NAME OF THE TOPIC** : PROCESSING AND CHARACTERIZATION OF PLANT NANO FIBERS REINFORCED POLYMER COMPOSITE.
5. **KEY WORDS** : COTTON NANO FIBERS, HEMP NANO FIBERS, AGAVE GIGANTEA NANO FIBERS, CELLULOSE, STEAM EXPLOSION

FINDINGS

COMPOSITES CAN BE DESCRIBED AS THE COMBINATION OF TWO OR MORE MATERIALS COMBINATION, COMPOSITES ARE LIGHTER IN WEIGHT AND POWERFUL IN STRENGTH. A SIMPLE CONCEPT IS JUST BEHIND THE DESIGNING OF COMPOSITE AND THAT IS THE COMBINATION OF MATRIX AND FIBERS, HERE FIBERS GIVE STRENGTH
TO THE MATRIX. KEEPING IN MIND OF ENVIRONMENT, NATURAL FIBERS ARE PREFERABLE OPTIONS IN COMPARISON TO OTHER
ARTIFICIAL FIBERS, BUT NATURAL FIBERS CAN'T GIVE MUCH STRENGTH IN COMPARISON TO OTHER FIBERS. SO, NANO-FIBRILS COME HERE TO OVERCOME THIS SITUATION. NANO-FIBRILS CAN BE EXTRACTED EASILY AND HAVE MORE STRENGTH IN COMPARISON TO OTHER NATURAL FIBERS. NANO-FIBRILS ARE NOTHING MORE THAN A FIBER OF
REQUIRED CONTENT LIKE CELLULOSE OR LIGNIN, A NATURAL FIBER CONTAINS CELLULOSE, HEMICELLULOSE, LIGNIN, WATER, AND OTHER BIO-CONTENTS. IF WE REMOVE ALL THE OTHER CONTENTS OF FIBER AND KEPT ONLY CELLULOSE OR LIGNIN THEN THE DIAMETER OF NATURAL FIBER WILL DECREASE. THAT CAN BE OF NANO-SIZE AND AS WE KNOW THAT CELLULOSE GIVES TENSILE STRENGTH AND LIGNIN GIVES COMPRESSIVE STRENGTH TO THE MATERIAL/PLANT, THEN THESE FIBERS ARE VERY BENEFICIAL FOR THE DESIGNING OF COMPOSITE.

BEFORE THE CREATION OF A COMPOSITE A NUMERICAL ANALYSIS HAS BEEN DONE TO STUDY THE BEHAVIOR OF COMPOSITES ON A PARTICULAR LOAD SO THAT WE CAN CREATE A COMPOSITE OF GREAT STRENGTH. ALL THE NUMERICAL ANALYSES ARE COMPLETED OVER ANSYS SOFTWARE AND UNDER SOME BOUNDARY CONDITIONS. SO, THIS PROJECT DISCUSSES THE EXTRACTION OF NANO-FIBRILS FROM NATURAL FIBERS AND USED THEM IN THE EPOXY MATRIX TO MANUFACTURE A COMPOSITE THAT HAS MORE STRENGTH THAN THE OTHER NATURAL FIBER COMPOSITE. IT IS OBSERVED THAT, DUE TO THE ALARMING POLLUTION LEVEL, THERE HAS BEEN A MARKED INCREASE
IN INTEREST IN BIODEGRADABLE MATERIALS FOR USE IN PACKAGING, AGRICULTURE, MEDICINE, AND OTHER AREAS.

AS A RESULT, MANY RESEARCHERS ARE INVESTING TIME IN DESIGNING NOVEL POLYMER COMPOSITES OUT OF NATURALLY OCCURRING MATERIALS. SEVERAL BIOLOGICAL MATERIALS MAY BE INCORPORATED INTO BIODEGRADABLE POLYMER MATERIALS, WITH THE MOST COMMON FIBER EXTRACTED FROM VARIOUS TYPES OF PLANTS. THE BELIEF IS THAT BIODEGRADABLE POLYMER MATERIALS WILL REDUCE THE NEED FOR SYNTHETIC POLYMER PRODUCTION (THUS REDUCING POLLUTION) AT A LOW COST, THEREBY PRODUCING A POSITIVE EFFECT BOTH ENVIRONMENTALLY AND ECONOMICALLY. IT IS INTENDED TO PROVIDE THE PROCESS OF EXTRACTING NANOFIBER THROUGH A CHEMICAL PROCESS WITH VARYING CONCENTRATIONS OF NAOH AND ALONG WITH VARIOUS TESTS SUCH AS SEM WITH EDS,XRD, AND FTIR OF EXTRACTED NANOFIBER CARRIED OUT TO STUDY THE MORPHOLOGICAL STRUCTURE,CONSTITUENTS, AND OTHER PROPERTIES, ETC, ALSO EXPLAINS THE FABRICATION OF EPOXY-BASED NANOCOMPOSITE

BY HAND LAYUP PROCESS. THEN VARIOUS MECHANICAL TESTING (TENSILE STRENGTH, IMPACT STRENGTH,TOUGHNESS, AND HARDNESS) WERE CARRIED OUT TO DETERMINE ITS BEHAVIOR UNDER DIFFERENT CONDITIONS OF LOADING FURTHER MOISTURE ABSORPTION TEST WAS CARRIED OUT TO STUDY ITS MOISTURE PICK-UP POTENCY. THIS WORK IS CARRIED OUT TO EVALUATE THE DEVELOPMENT AND PROPERTIES OF NATURAL FIBER-REINFORCED
BIODEGRADABLE POLYMER COMPOSITES. THEY ARE MATERIALS THAT CAN FULLY DEGRADE AND ARE COMPATIBLE WITH THE ENVIRONMENT. THIS WORK DEALS WITH THE EXTRACTION AND CHARACTERIZATION OF AGAVE GIGANTEA AND HEMP FIBER. AGAVE GIGANTEA AND HEMP WERE TREATED WITH CHEMICALS LIKE ALKALI, BLEACH, AND
MILD ACID. THE LEAVES OF AG WERE CHEMICALLY EXTRACTED USING ALKALI TREATMENT WITH NAOH AT DIFFERENT PERCENTAGES (4%, 6%, AND 8%) TO OBTAIN CELLULOSE FIBERS. THE AG LEAVES CONSIST OF
CELLULOSE, HEMICELLULOSE, LIGNIN, WAX, AND PECTIN BUT AFTER EACH CHEMICAL STEPS THE PERCENTAGE OF THE UNWANTED COMPONENT DECREASES. TO UNDERSTAND THE EFFECT OF CHEMICALS ON FIBER COMPONENTS, REWARDED FILAMENTS WERE ANALYZED BY UTILIZING A FILTERING ELECTRON MAGNIFYING LENS (SEM) WITH EDS, FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY, AND X-BEAM DIFFRACTION PROCEDURE (XRD).
AN OBTAINED RESULT SHOWS THAT HEMICELLULOSE WAS DEBASED QUICKER THAN THAT CELLULOSE AND LIGNIN.

CELLULOSE DISPLAYED BETTER WARM SOLIDNESS AND LIGNIN WAS CORRUPTED IN A WIDE SCOPE OF TEMPERATURES. THE HYDROPHILIC IDEA OF THE FILAMENTS WAS PREVALENTLY BROUGHT ABOUT BY THE NEARNESS OF HEMICELLULOSE AND AFTERWARD LIGNIN CONSTITUENTS. HEMICELLULOSE AND LIGNIN WERE FOR THE MOST PART EVACUATED BY THE ALKALIZATION WITH NAOH, THROUGH BLEACHING THE REMAINING IMPURITIES WILL REMOVE. MILD ACID WILL GIVE THE NANOCELLULOSE IN FIBRILS FORMS, NANO CELLULOSE FIBERS FROM AG CAN BE USED AS REINFORCEMENT IN ENVIRONMENTALLY FRIENDLY POLYMER BIOCOMPOSITES. THIS TREATMENT ENCOURAGED COUPLING WITH THE FIBERS CONSTITUENTS.