

№	Project Name	Head of Project	Project start and end years	Volume (Amount)	Status Finished/Current	Grant Code
1	Experimental investigation of the effect of artificial roughness on heat transfer to falling water film on the outer surface of the vertical tube	T. Magraqvelidze	09.03. 2020-09.03. 2023	240 000 GEL	finished	<b>FR-19-3034</b>

### Abstracts:

#### 1. -specific result-

As a result of the analysis of the relevant literature data, the relevance of the tasks set in the project and the problems that have remained unresolved at the moment were revealed. To achieve the goal, an experimental setup was created, on which experiments were carried out to study the process of heat transfer of a liquid flowing down a vertical surface, both for smooth and rough surfaces. In the experiments, the Reynolds number varied approximately from 150 to 40,000, and the Prandtl number, from 3 to 19. The influence of various types and geometric parameters of roughness (two-dimensional, pyramidal, dimpled, and combined) on heat transfer was studied. As a result of the experiments, it was found that from the point of view of intensifying heat transfer and simplicity of manufacturing technology, the best is two-dimensional roughness with a relative step between roughness elements  $s/h=10$ .

Along with this, a number of important results were obtained in experiments, the most remarkable of which is that, under conditions of liquid flow down a vertical pipe, the creation of artificial roughness on the heat transfer surface leads to a significant increase in the heat transfer intensity. It is established that the degree of intensification is the highest in the zone of transition from laminar-wave flow to turbulent ( $Re=1600 - 5000$ ). In this zone, the maximum value of the degree of intensification reaches about 6. With a further increase in the Reynolds number, the intensification of heat transfer decreases, but still remains quite significant. It was also found that artificial roughness leads to a decrease in the critical value of the Reynolds number. According to the obtained results, an increase in the Prandtl number of the coolant leads to a significant increase in the degree of heat transfer intensification.

During the implementation of the project, we developed a remote (non-contact) method of temperature measurement of the heat transfer surface, which allowed us to determine the image of the temperature field on

the heat transfer surface during heat transfer in down flowing liquid film on the vertical flat plate.

An attempt is made to generalize the experimental data obtained for rough surfaces by modifying the well-known D. Labuntsov formula for smooth surfaces.

During the implementation of the project, the need for further research was highlighted, in which, among other issues, the image of the temperature field of the heat exchange surface with various types of roughness will be studied, taking into account the fact that the method of measuring of the temperature of the wall developed by us allows this. It will help to determine the heat transfer mechanism of rough surfaces.

## **2 - Recommendations**

Very serious results have been obtained in the research, which are of great importance both from a practical and a theoretical point of view.

The obtained results contribute to the further study of the fundamental issues of the field of heat transfer, one of the branches of the discipline of thermodynamics. In particular, the method of measuring the local temperatures of the heat emitting wall, developed by us, will significantly simplify the determination of the mechanism of the heat transfer process of rough surfaces.

The obtained results are also important from the point of view of studying the issues of hydrodynamics of Garsden with fluids on rough surfaces.

The methodology developed by us and the obtained results will help young scientists to advance academically. This is due to the fact that the device, on which the experiments envisaged by the project were conducted, is still in operation after the end of the project, and a number of interesting experimental studies can be conducted on it and a thesis can be prepared.

An experimental base for the design and manufacture of highly efficient heat transfer devices has been prepared for practical application of the obtained results. Using the obtained results in the condensers of thermal power plants, metallurgical, chemical, food technology, aviation, rocket, space technology and other industries where the heat transfer process originates on the surface under the conditions of the flow of air, the use of the artificial pore method will practically reduce the area of the heat transfer surface by two times or more. This leads to the compactness of the devices and the saving of metal materials, which is of great economic importance.

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1	The Compiler of the Georgian-English Grammatical Dictionary	A. Chutkerashvili	2022-2025	180000 gel		FR-21-3509

The purpose of the electronic grammatical dictionary is to provide information on the morphological and syntactic characteristics of the dictionary unit, which are essential for structuring correct grammatical phrases. These types of dictionaries are used as a tool of automated morphological analysis while processing texts.

The project considers developing a compiler system of Georgian-English grammatical online dictionary. Compiler tools will be placed on the website. Initially, the modern Georgian and its corresponding English grammatical dictionaries will be uploaded into the system as a core of basic vocabulary. The system will give the user the full paradigm of the corresponding lemma of any word-form.

It will be possible to find the corresponding lemma of any word-form, as well as to show its inflection paradigm in Georgian and English languages. The dictionary will also provide derivation. The customer will be given a full paradigm of seeking term and possible derivatives of the word. It will be possible to generate derivative forms as well as their inflection paradigms.

A compiling system of the Kartvelian language grammatical dictionaries will be placed on the Internet. Linguists will be able to compile a grammatical dictionary of the desired language dialect independently by using its tools. After signing up and downloading the required applications from the website the user-linguist will be able to compile a grammatical dictionary of one of the subsystems of the Georgian language based on the selected text corpus. In the long-term perspective, the Georgian-English translation of any Kartvelian languages will be possible.

In the first reporting period, the works were carried out according to the following tasks:

1. Development and systematization of classification characteristics of inflectional and derivational Georgian and English verb, noun, adjective, numeral, pronoun and unchangeable words for grammatical dictionary;
2. Development of stereotypical patterns/forms of paradigms with homogeneous characteristics for the Georgian and English verb, noun, adjective, numeral, pronoun and unchangeable inflectional and derivational word-forms and realization the desktop application for their testing;

3. Development of the algorithm for searching the supposed forms of Georgian and English verb, noun, adjective, numeral, pronoun and unchangeable words paradigms by classification characteristics and realization the desktop application;

4. Development of the online application of Georgian-English Grammatical Dictionary; To put it on the internet and testing.

4 articles were published on the subject of the mentioned works in a non-rated journal and a presentation was organized at an international scientific conferencet in Georgia.