# Application of molecular physics methods in the development of the new technologies in aeronautical industry

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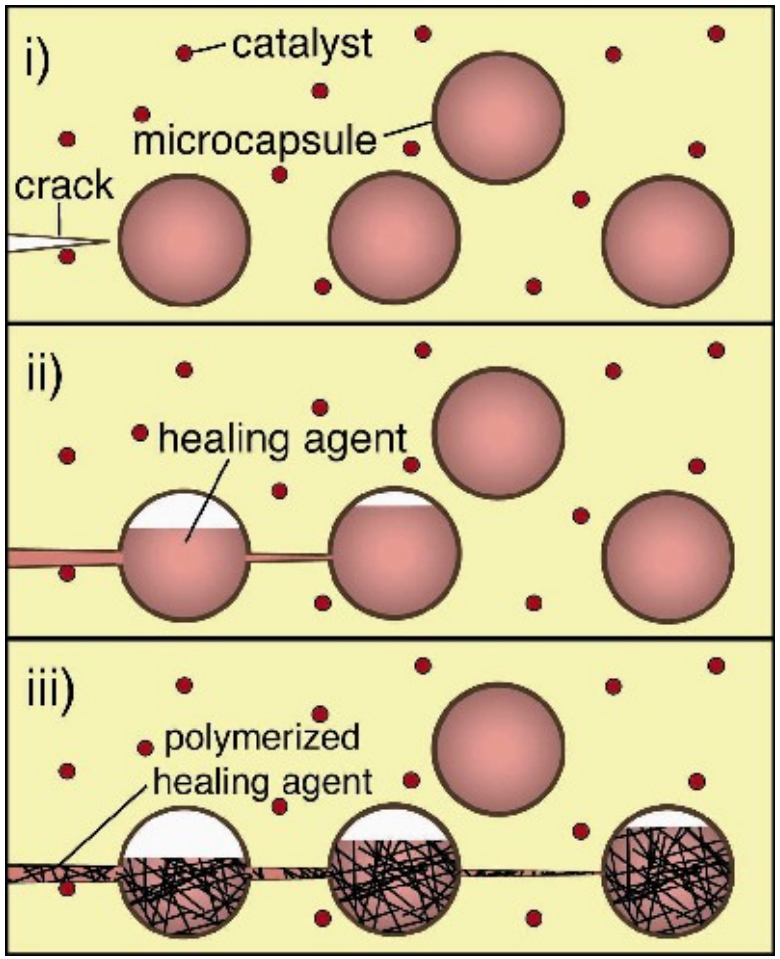
# Main directions of scientific research work are:

- Development of the composition of liquid agents for the Self-healing Spacecraft systems
- Study of the deformation properties and dispersion mechanisms of the paraffin-based ecological fuel
- Development of the adhesives for manufacturing solar batteries and constractive elements of space apparatus.

# Development of the composition of liquid agents for the Self-healing Spacecraft systems




**Scanning electron microscope image of a ruptured microcapsule**Photo courtesy University of Illinois

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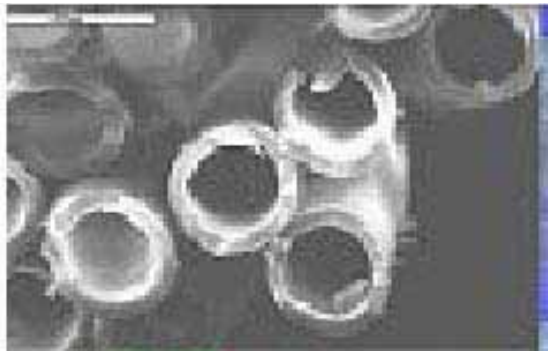


The Fibre for Self-Healing Spacecraft systems

**<u>Problem :</u> the delivery of a necessary quantity of liquid agents to the place of damage.**

## Simple 1

## Simple 2

УКРАЇНА UKRAINE

# П А Т Е Н Т

**НА ВИНАХІД**

**№ 78094**

**СПОСІБ ВИЗНАЧЕННЯ РЕОЛОГІЧНИХ ХАРАКТЕРИСТИК КОНСИСТЕНТНИХ РІДИН**

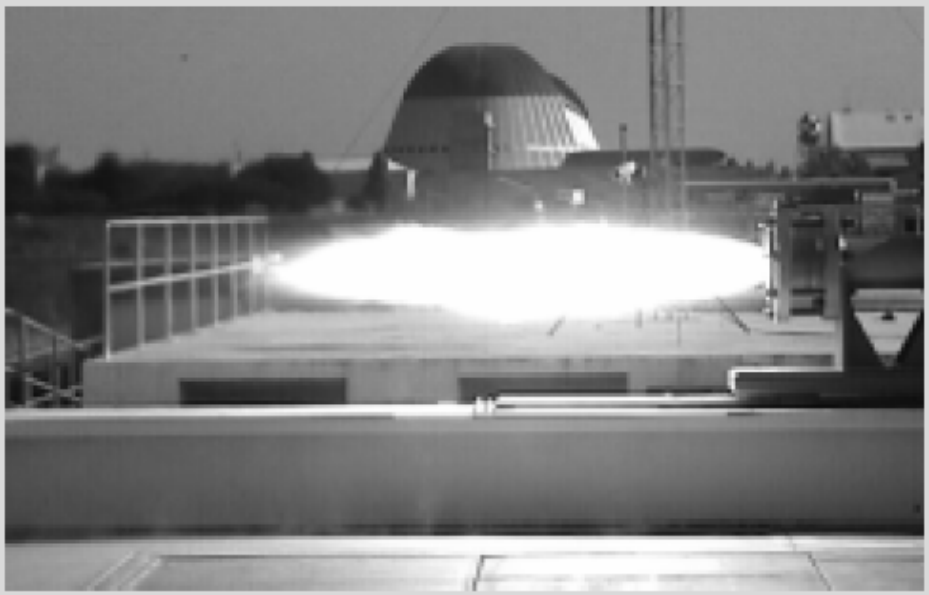
Видано відповідно до Закону України "Про охорону прав на винаходи і корисні моделі".

Зареєстровано в Державному реєстрі патентів України на винаходи **15 лютого 2007 р.**

Голова Державного департаменту інтелектуальної власності М.В. Паладій

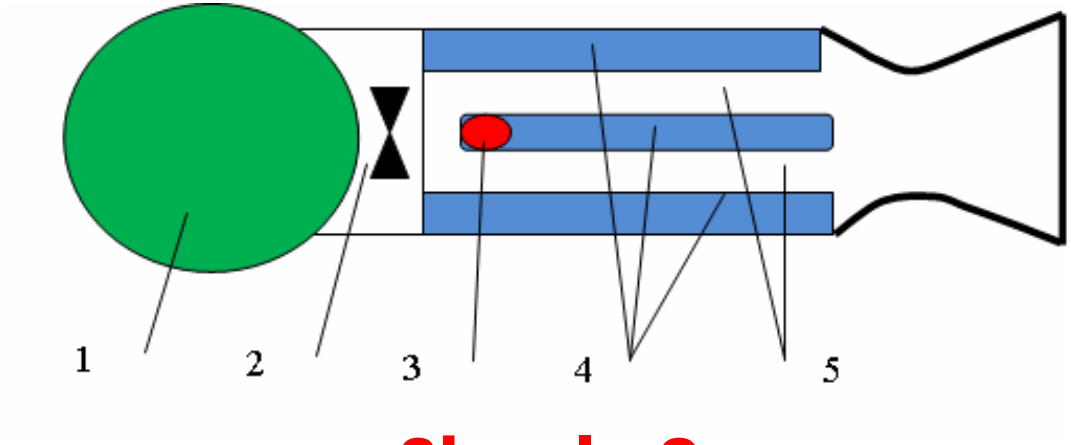
# Study of the deformation properties and dispersion mechanisms of the paraffin-based ecological fuel

**Problem :** the reaching high rate of combustion

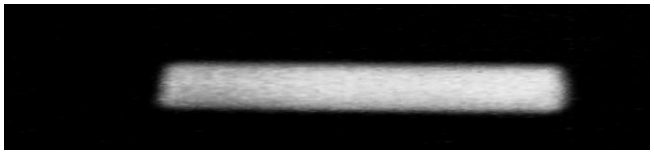


*Test firing of a hybrid rocket using paraffin-based fuel at Ames' Hybrid Combustion Facility*

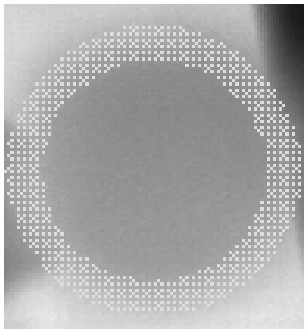
# The engine of paraffin based fuel



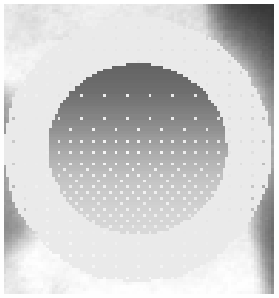

## Simple 3



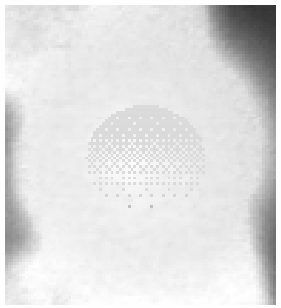
# View of  sample 3 during melting



5 min



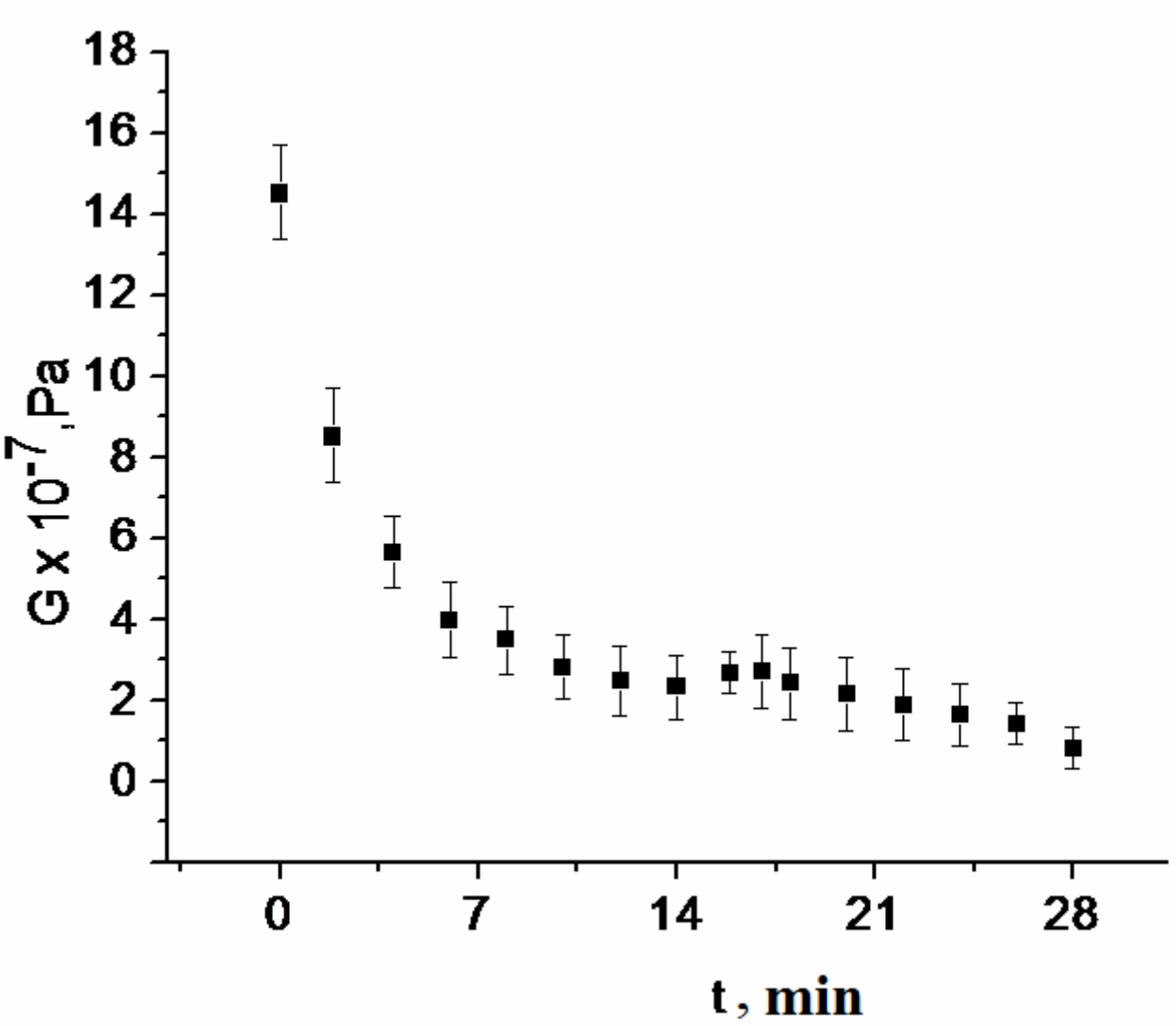
10 min



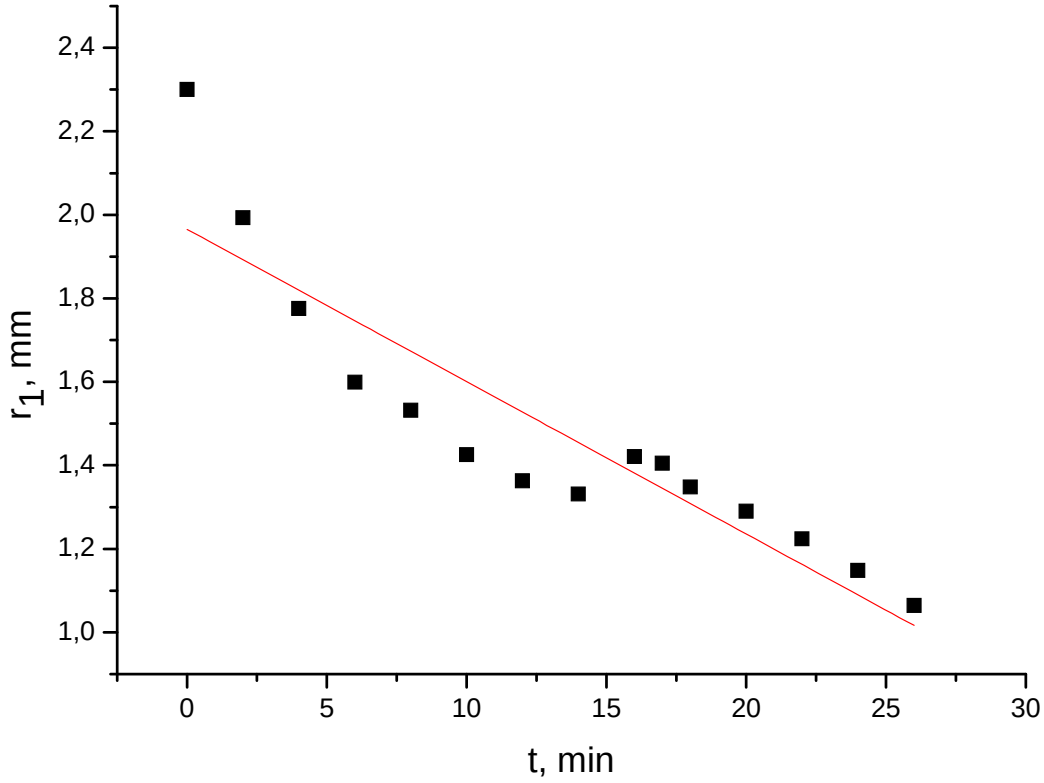
20 min

28min

# The shear modulus time dependence for sample 3



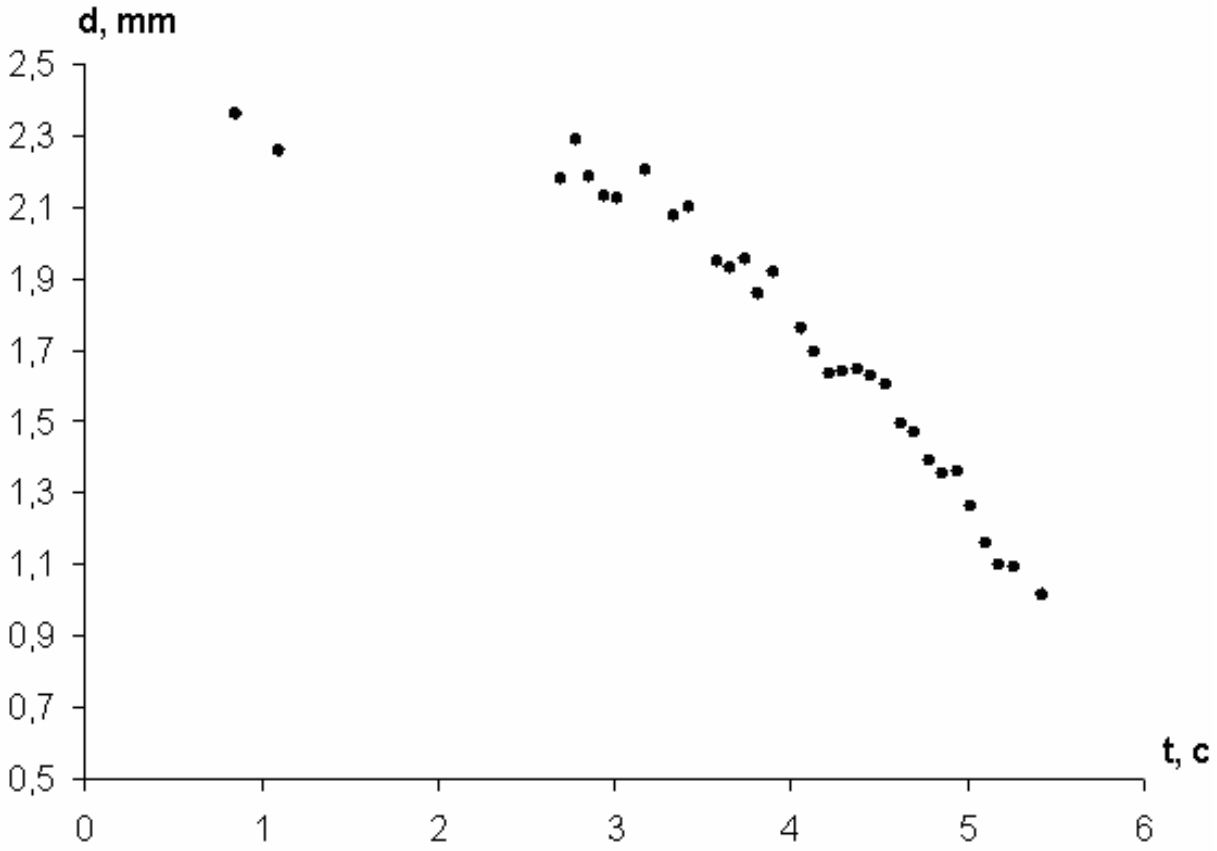
# Change in the melting front of the simple 3




The speed of the front of melting proved to be equal to 0,036 mm/s.

Combustion of the drop of the model of №3

# Temporary dependences of the current diameter of the burning drop of sample 3

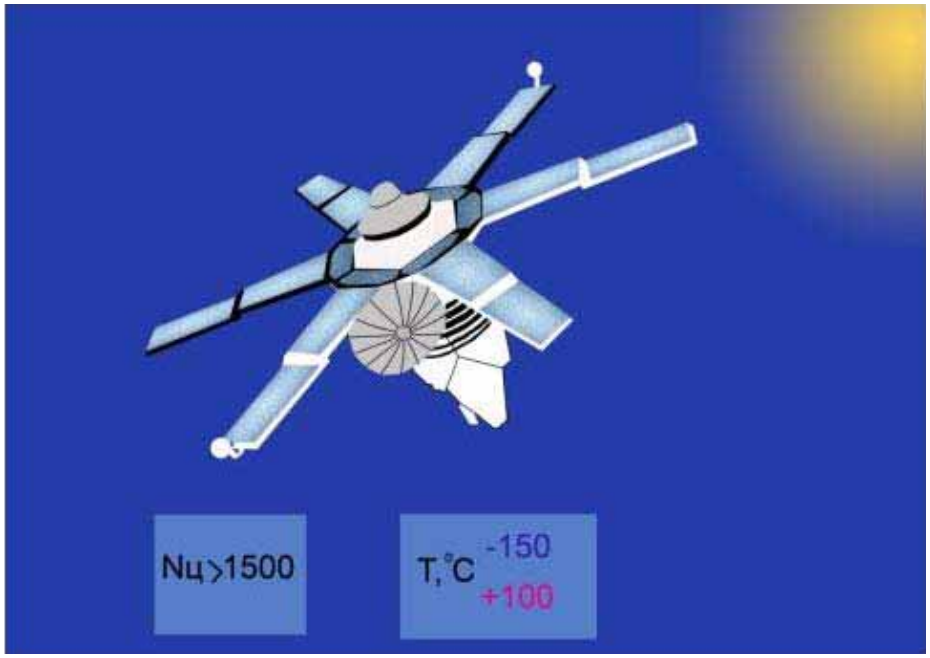



speed of flame 0,25 mm/s.

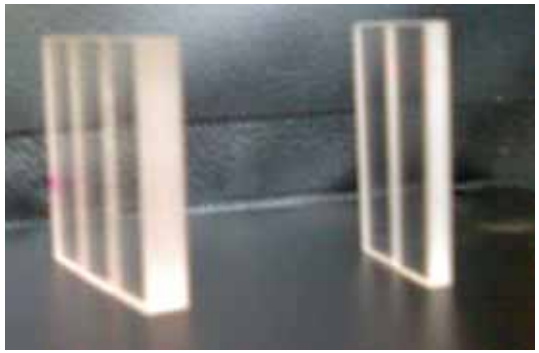
## •Development of the adhesives for manufacturing solar batteries and constractive elements of space apparatus.

**<u>Problem</u>: protection of aeronautical constructive elements from the outer space influence: vacuum, electromagnetic radiation, ionizing radiation, active particles of plasma, thermocycling etc.**

**Thermo-regulated protective coating for devices of flying vehicles**




**The created epoxyurethane compositions were used in the manufacturing of the carbonplastic frames of the SA “Sich-2” telescope**



# Publications (selected):


•**Bulavin L.A., Aktan O.Yu, Zabashta Yu.F. and Nikolayenko T.Yu.**, *Ukraine Patent No 78094 (2007).*

•**Todosiychuk T.T., Krivchenko G.M., Yashenko L.M.** Ukraine Patent *No 84531* (2008).

•**Bulavin L.A., Aktan O.Yu., Zabashta Yu.F., Orlovskaya S.G.** The Deformation Properties and the Dispersion of Paraffin-Based Hybrid Rocket Fuel in the Process of the Combastion/ Modern Science ( Collection of Research Papers) №2, 2009 , pp. 3-5.

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•**Bulavin L.A., Aktan O.Yu., Zabashta Yu. F.**// Polymer Science. Ser.A., Vol.44, №9, 2002, pp.980-985.

•**Bulavin L. A., Aktan O. Yu., Zabashta Yu. F.** // Polymer Science. Ser.A., Vol.45, №10. 2003.pp.1007-1010.

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•**Bulavin L.A., Aktan O.Yu., Lazarenko M.M.**// Ukrainian Journal of Physics.-2005.-№9. – pp.952-957.

• **Bulavin L.A., Aktan O.Yu., Nikolaenko T.Yu., Sheiko N.L. and Myagchenko Yu.A.,** Instruments and Experimental Techniques**.** № **3,** p. 164-165, 2007.

•**Todosiychuk T.T.** Polymer Science, Series D, Vol,1 number 1, pp.23-27 (2008)

•**Yarovaya N.V, Kosyanchuk L.F.** Molecular Crystals and Liquid Crystals, 2008, Vol.483, number 2, p.191-204.

•**Kalinchuk, Struchaev A.I., Orlovskaya S.G.**Physics of combustion and explosion, number 1(1990), p,92-96.

thanks
for the
attention