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APPLICATION OF ANALYTIC NETWORK PROCESS: WEIGHTING OF SELECTION CRITERIA TO SELECT THE SUITABLE METHOD FOR THE PREPARATION OF NANOCRYSTALS

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ABSTRACT: This article presents a logical technique to select the best method for the preparation of nanocrystals by implementing the analytic network process. One of the most significant decision-making tools to make excellent decisions is Analytic Network Process which includes Model construction, Paired assessments between each two clusters or node, Super matrix assessment based on outcomes from paired comparisons, and result investigation for the evaluation. So in order to avoid wrong conclusions, we use the Analytic Network Process tool because it is well organized and logical compared to other decision-making techniques. Based on the results of the overall priority analysis, the alternative M2 Sonoprecipitation method scores 0.088857, which is highest when compared to other alternatives. This study reveals that the Sonoprecipitation method is the most appropriate technique for the preparation of Nanocrystals. This paper concludes that ANP evolved by Saaty is a good decision-making device, done by using a software super decision which is very easy to make the right decision and conclusion. With the outcome of ANP method and Super decision software, the study reveals that Sonoprecipitation method is the most suitable method for the preparation of nanocrystals since it has the highest value compared to other methods. Hence to obtain reliable and efficient decisions, ANP has been employed.

INTRODUCTION: Nowadays, for the treatment of a variety of diseases, technical research has been wide-spreading to determine and develop drugs. Recently it has been reported that Nano drug delivery systems like nanoparticles, nanospheres, nanosponges, solid lipid nanoparticles, molecular system (inclusion complexes), nanoemulsions, nano-vesicular system (Liposome, niosomes), nano-suspension, and Nanocrystals [1] have presented with the aim to increase bioavailability and also to optimize bioavailability by changing the concentration of drug in the body fluids [2, 3].

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So in order to overcome this problem, many researchers developed an innovative drug delivery system called nanocrystals which is also a novel drug delivery system [4].

Today, Novel drug delivery systems (NDDS) are the cutting edge of research in the pharmaceutical field [5]. The rate of absorption of a drug depends on the dosage form. Drugs are formulated into many dosage forms such as retarded release, sustained release, prolonged action, depot, enteric release, and timed release medication [6]. The invention or discovery of so many dosage forms or medications is due to so many reasons. Some of the main reasons include *viz*: to reduce the production cost, expiry of the patents, lack of therapeutic efficacy and safety [7, 8].

There are a variety of approaches that are available for accomplishing NDDS such as targeted delivery

systems, transdermal schemes, intravaginal and intrauterine schemes, prodrugs, ocular schemes, nanoparticles, nanocrystals, reservoir devices, injections and implants, matrix devices, and micro-encapsulation. Nanocrystals are one of the most productive advances [9].

Drug nanocrystals are nanoparticles with a crystalline character. According to the size unit, drug nanocrystals vary in size between a few to 1000 nm, and drug microcrystals possess a size of 1–1000 μm [10]. Nanocrystal is composed of active pharmaceutical ingredients (API), water, and stabilizer. In order to stabilize nanocrystals, the stabilizer is added, and it depends on two mechanisms: electrostatic stabilization or steric stabilization and charge. For improved long-standing stability, occasionally, more than one stabilizer has been used [11, 12]. Freeze drying is done to improve physical stability [13].

The unique features of nanocrystals include improvement of saturation solubility, dissolution velocity, and gumminess to surface/cell membranes. The most important typical features of drug nanocrystals are the increased saturation solubility and accelerated dissolution velocity [14]. Another feature of drug nanocrystals is their specific adhesiveness [15]. The high adhesiveness can be considered another factor in improving the oral absorption of poorly soluble drugs. The adhesive-ness of the particles to the gut wall after oral administration further enhances the bioavailability.

These nanocrystals can be applied through many administration routes, such as oral, parenteral, ocular, pulmonary, and dermal delivery. As known, the oral route is the most important and the first choice route for drug delivery because of its several advantages, including convenience, safety, inexpensive, *etc*. [16]

There are many methods for the preparation of nanocrystals, and here, we have selected four methods: Hydrosol, Sonoprecipitation, Spray freezing into liquid, and Nanomorph®. There is a need to select a suitable method for the preparation of nanocrystals. So we have decided to use a decision-making tool such as the analytic network process to select the best method. While selecting or choosing a method or a technique to prepare nanocrystals, there are many factors that are to be taken into consideration like expenditure, consis-tency, viability, processing condition, and qualitative and quantitative analysis para-meters and then come to a conclusion when numerous options are there. The purpose of using ANP is to make or choose an optimum decision because a wrong conclusion may lead to numerous complications.

The selection of the method depends on a number of criteria and sub-criteria. The rest of this paper is about: introduction to ANP, the proposed ANP algorithm (steps), an application for appropriate preparation method assortment utilizing ANP. The last part concludes the outcome [9].

Analytic Network Process: The Analytic Network Process (ANP) is a multi-criteria decision-making tool is introduced by Saaty [9]. This is a significant decision-making tool to make excellent decision [17]. Multi-Criteria Decision Making (MCDM) means choosing or prioritizing alternatives from a set of accessible alternatives with respect to multiple criteria [9]. In both AHP and ANP decision problem is structured hierarchically from an overall objective at the top to various criteria, sub-criteria, and so on until decision alternatives at the lowest level [9]. Decision-makers have to judge each element, and the judgments are made on the basis of decision-makers' experience and knowledge.

One of the most significant decisions supporting tool is the Analytic Network Process which is the generalization of Saaty's Analytic Hierarchy Process [18]. There are four common steps in ANP which includes

1. Model construction
2. Paired assessments between each two cluster or nodes
3. Super matrix assessment based on outcomes from paired comparisons and
4. Result investigation for the evaluation [19, 20]

Proposed ANP Algorithm:

The workflow of ANP is depicted in **Fig. 1**.

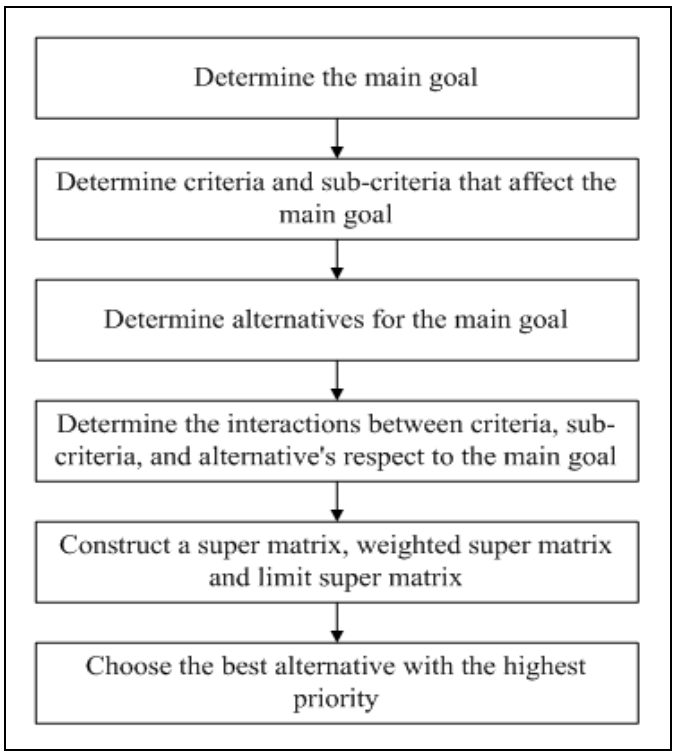

FIG. 1: ANALYTIC NETWORK PROCESS (ANP) WORKFLOW

In a supermatrix, each element is represented at one row and one respective column. If the column sum of any column in the composed supermatrix is greater than 1, that column will be normalized. Such a supermatrix is called the super weighted matrix. The weighted supermatrix is then raised to a significantly large power in order to have the converged or stable values. The values of this limit matrix are the desired priorities of the elements with respect to goal [21].

Selection of Suitable Method for Preparation of Nanocrystal by using ANP: In this study, the ANP approach has been used to select the best method for the preparation of nanocrystals. The selection method for preparation is vital because the selected method must be feasible, and also it should give consistent results with high yield. As shown in **Fig. 2,** criteria, sub-criteria, and alternatives are defined, and the main criteria are method information, operational skill, viability, and technical information.

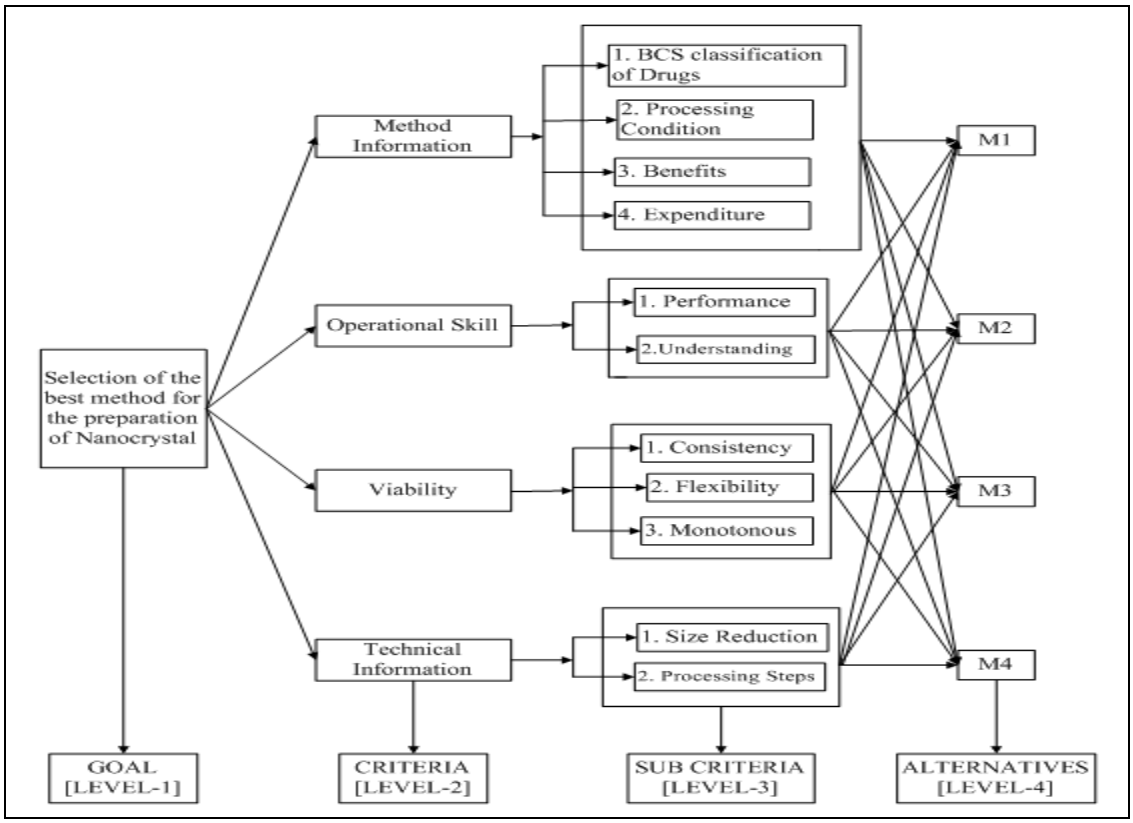

FIG. 2: THE MODEL FOR THE GOAL, SELECTING THE APT METHOD USING ANP

Criteria: Method Information: Sub-criteria under this are BCS (Biopharmaceutical classification system), Classification of drugs (BCS), Processing conditions (PC), Benefits (BE), and Expenditure.

Criteria: Operational Skill: Sub-criteria under this are Performance (PR) and Understanding (UN).

Criteria: Viability: Sub-criteria under this are Consistency (CO), Flexibility (FX), and Monotonous (MO).

Criteria: Technical Information: Sub-criteria under this are Size reduction (SR) and Processing steps (PS).

The alternatives M1 Hydrosol, M2 Sono-precipitation, M3 Spray freezing into liquid, and M4 Nanomorph® techniques are four different methods to prepare nanocrystals and are shown in **Fig. 2** and **Fig. 3**. In **Fig. 2** the model that is written to Super Decisions software can be seen. Binary comparisons have to be done after determining the criteria, sub-criteria, and alternatives. After completing binary comparisons, these data are entered into Super Decisions software which is illustrated in **Fig. 4**. Decision-makers have to judge each element, and the judgments are made on the basis of decision-makers' experience and knowledge. For example, when making binary comparisons, if viability is moderately more important than technical information, then assign the value 3 towards viability as shown in **Fig. 4**.

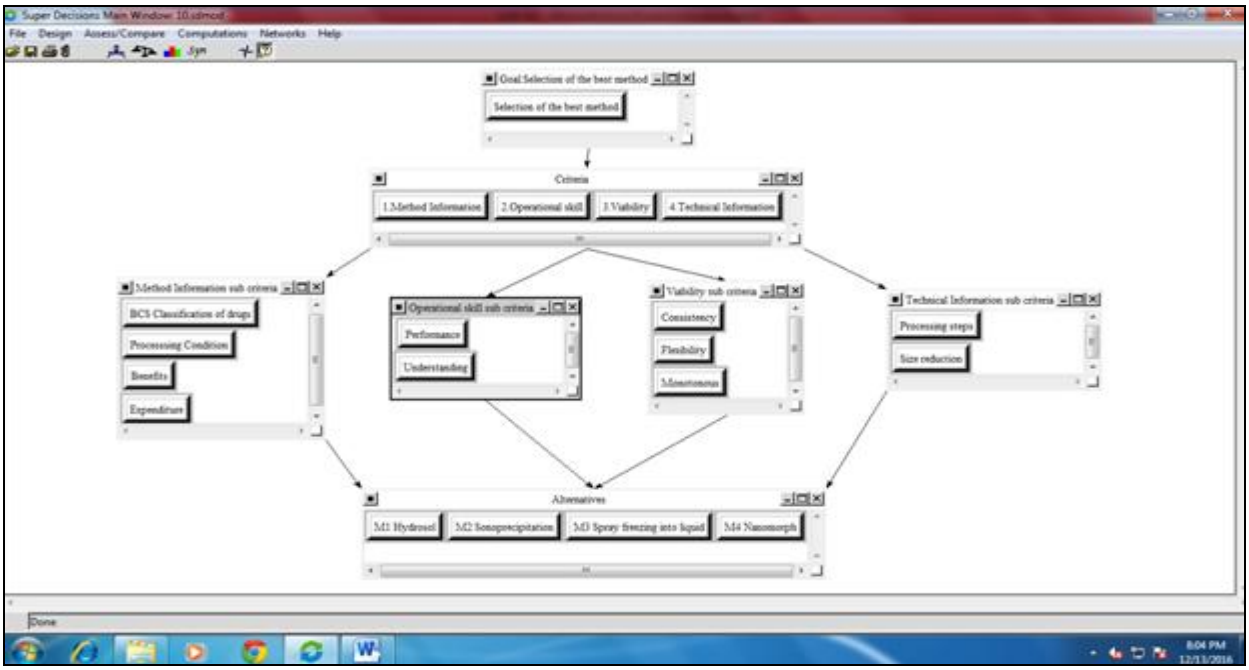

FIG. 3: THE RELATION BETWEEN GOAL, CRITERIA, SUB-CRITERIA AND THE ALTERNATIVES

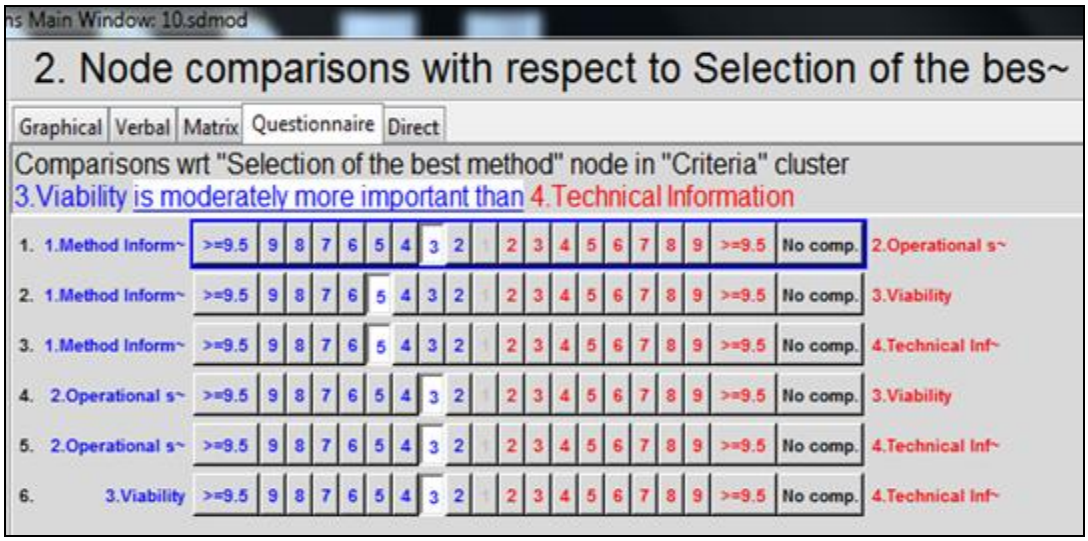

FIG. 4: ENTERING DATA TO SUPER DECISION SOFTWARE

The Super Matrix used in this Paper is as Follows: The impact of the goal on the criteria (CRs) is represented by a vector W_1. The impact of the CRs on each of the alternatives (ALTs) is

denoted by a matrix W_2. The inner dependence of the CRs and the inner dependence of the ALTs are represented by matrices W_3 and W_4. After entering the data, the results of an unweighted supermatrix, weighted supermatrix, and limit supermatrix are shown in **Tables 1, 2,** and **3**. Finally, the selection of the best method for the preparation of nanocrystals is calculated from priorities, as shown in **Fig. 5**.

$$\begin{matrix} Goal(G) \\ W = CRs \\ ALTs \end{matrix} \begin{matrix} Goal(G) & CRs & ALTs \end{matrix} \begin{bmatrix} 0 & 0 & 0 \\ W_1 & W_3 & 0 \\ 0 & W_2 & W_4 \end{bmatrix}$$

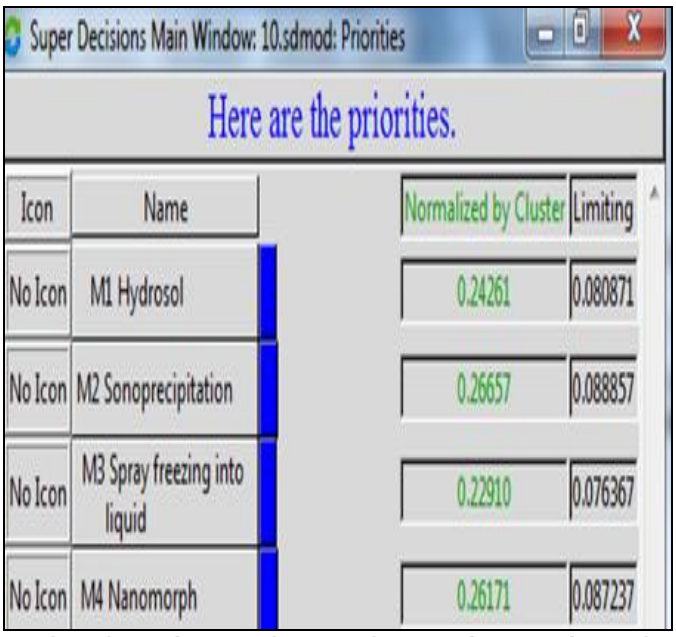

FIG. 5: OVERALL PRIORITY FOR THE ALTERNATIVES

RESULTS: The following results were obtained when we weigh the selection criteria and sub-criteria for the preparation of nanocrystals. The main concern of the alternatives which are the decision alternative M1 Hydrosol, M2 Sono-precipitation, M3 Spray freezing into liquid, and M4 Nanomorph® are shown in **Fig. 5**. Among all the methods, M2 is the best method for the preparation of nanocrystals on the basis of overall priority analysis.

The results of sensitivity analysis are shown in **Fig. 6,** which gives a representation of the peak criteria and sub-criteria. In **Tables 1, 2,** and **3** the values of the unweighted matrix, weighted matrix and limit matrix are shown, displaying the priorities of the criteria and sub-criteria through which the importance is judged.

This paper concludes that ANP evolved by Saaty is a good decision-making device, done by using a software super decision which is very easy to make the right decision and conclusion. When we select criteria and sub-criteria components, and when they are inter-related, it influences between the criteria clusters to select the right method.

With the outcome of the ANP method and Super decision software the study reveals that the Sono-precipitation method is the most suitable method for the preparation of nanocrystals since it has the highest value compared to other methods. Hence to obtain reliable and efficient decision ANP has been employed.

TABLE 1: UNWEIGHTED MATRIX

	M1	M2	M3	M4	MI	OS	VI	TI	GOAL	BCS
M1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06364
M2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12191
M3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.27055
M4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.54390
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.54949	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.24761	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12926	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.07364	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.50829	0.00000	0.00000	0.00000	0.00000	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.26533	0.00000	0.00000	0.00000	0.00000	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.07520	0.00000	0.00000	0.00000	0.00000	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.15118	0.00000	0.00000	0.00000	0.00000	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.83333	0.00000	0.00000	0.00000	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.16667	0.00000	0.00000	0.00000	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25000	0.00000	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.75000	0.00000	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.63699	0.00000	0.00000	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25828	0.00000	0.00000	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10473	0.00000	0.00000	0.00000

	BE	EX	PC	PR	UN	PS	SR	CO	FX	MO
M1	0.12663	0.52288	0.28763	0.30312	0.17504	0.51283	0.41173	0.41312	0.57406	0.42458
M2	0.16248	0.26256	0.50482	0.38895	0.40923	0.22609	0.30981	0.36033	0.12416	0.28198
M3	0.48745	0.11575	0.14308	0.12965	0.17504	0.19300	0.20971	0.10645	0.15089	0.21320
M4	0.22344	0.09881	0.06447	0.17829	0.24070	0.06809	0.06876	0.12011	0.15089	0.08024
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 2: WEIGHTED MATRIX

	M1	M2	M3	M4	MI	OS	VI	TI	GOAL	BCS
M1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06364
M2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12191
M3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.27055
M4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.54390
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.54949	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.24761	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12926	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.07364	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.50829	0.00000	0.00000	0.00000	0.00000	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.26533	0.00000	0.00000	0.00000	0.00000	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.07520	0.00000	0.00000	0.00000	0.00000	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.15118	0.00000	0.00000	0.00000	0.00000	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.83333	0.00000	0.00000	0.00000	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.16667	0.00000	0.00000	0.00000	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25000	0.00000	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.75000	0.00000	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.63699	0.00000	0.00000	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25828	0.00000	0.00000	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10473	0.00000	0.00000	0.00000
	BE	**EX**	**PC**	**PR**	**UN**	**PS**	**SR**	**CO**	**FX**	**MO**
M1	0.12663	0.52288	0.28763	0.30312	0.17504	0.51283	0.41173	0.41312	0.57406	0.42458
M2	0.16248	0.26256	0.50482	0.38895	0.40923	0.22609	0.30981	0.36033	0.12416	0.28198
M3	0.48745	0.11575	0.14308	0.12965	0.17504	0.19300	0.20971	0.10645	0.15089	0.21320
M4	0.22344	0.09881	0.06447	0.17829	0.24070	0.06809	0.06876	0.12011	0.15089	0.08024
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE 3: LIMIT MATRIX

	M1	M2	M3	M4	MI	OS	VI	TI	GOAL	BCS
M1	0.00000	0.00000	0.00000	0.00000	0.07437	0.14089	0.22794	0.21850	0.08087	0.06364
M2	0.00000	0.00000	0.00000	0.00000	0.10057	0.19616	0.14556	0.14444	0.08886	0.12191
M3	0.00000	0.00000	0.00000	0.00000	0.14860	0.06861	0.06455	0.10276	0.07637	0.27055
M4	0.00000	0.00000	0.00000	0.00000	0.17646	0.09435	0.06194	0.03429	0.08724	0.54390
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.18316	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.08254	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.04308	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02455	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.25414	0.00000	0.00000	0.00000	0.09310	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.13267	0.00000	0.00000	0.00000	0.04860	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.03760	0.00000	0.00000	0.00000	0.01377	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.07559	0.00000	0.00000	0.00000	0.02769	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.41667	0.00000	0.00000	0.06878	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.08333	0.00000	0.00000	0.01376	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12500	0.00614	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.37500	0.01841	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.31849	0.00000	0.02745	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.12914	0.00000	0.01113	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05237	0.00000	0.00451	0.00000

	BE	EX	PC	PR	UN	PS	SR	CO	FX	MO
M1	0.12663	0.52288	0.28763	0.30312	0.17504	0.51283	0.41173	0.41312	0.57406	0.42458
M2	0.16248	0.26256	0.50482	0.38895	0.40923	0.22609	0.30981	0.36033	0.12416	0.28198
M3	0.48745	0.11575	0.14308	0.12965	0.17504	0.19300	0.20971	0.10645	0.15089	0.21320
M4	0.22344	0.09881	0.06447	0.17829	0.24070	0.06809	0.06876	0.12011	0.15089	0.08024
MI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
OS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
VI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TI	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
GOAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BCS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
BE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
EX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
UN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
PS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
CO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
MO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

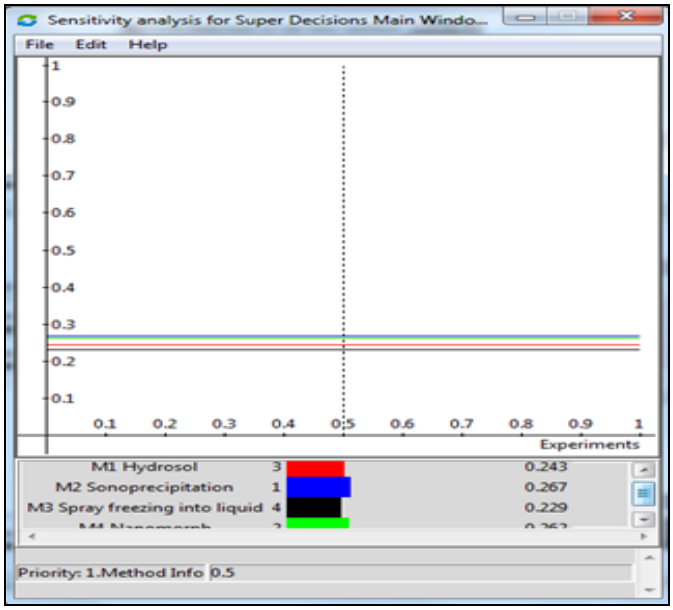

FIG. 6: SENSITIVITY ANALYSIS

DISCUSSION: This paper concludes that ANP evolved by Saaty is a good decision-making device, done by using a software super decision which is very easy to make the right decision and conclusion. When we select criteria and sub-criteria components, and when they are inter-related, it influences between the criteria clusters to select the right method.

CONCLUSION: This paper aims to present a systematic approach for selecting the best method for the preparation of nanocrystals by implementing one of the most effective decision-making tools that is ANP. ANP is very helpful in selecting the best method based on the criteria and sub-criteria aspects of a decision. As per saaty, the alternative with the highest priority will be chosen as best alternative. With the outcome of ANP

method and super decision software, the study reveals that the Sonoprecipitation method is the most suitable method for the preparation of nanocrystals since it has the highest value compared to other methods. Hence to obtain reliable and efficient decision ANP has been employed.

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