



RESEARCH ARTICLE

HOMEOPATHY A MATERIAL SCIENCE! NANOPARTICLE CHARACTERIZATION OF
AURUMMETALLICUM 6C, 30C, 200C, 1000C, 10000C, 50000C AND 100000C

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ABSTRACT

Background: In the earlier research publications of the author he has identified the presence of nanoparticles (NPs) of the drug material in all the higher dilutions of homeopathic drugs; viz, *Lycopodium* and *Ferrummetallicum*.

Method: The present study is done with the help of HRTEM (High Resolution Transmission Electron Microscope) and EDS (Energy Dispersive Spectroscopy).

Result and Conclusion:

1. The analysis of homeopathic drug *Aur met* (Gold) shows the presence of nanoparticles of Gold in all the potencies studied, i.e. 6c, 30c, 200c, 1000c, 10000c, 50000c and 100000c
2. Nanoparticles of *Aur met* were found mostly in Quantum Dots scale in all the dilutions.
3. The study proves that homeopathy is really a material science and not merely an energy medicine or placebo therapy as considered earlier.

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INTRODUCTION

Homeopathy a therapeutic method (Carol Dunham, 1995) discovered by Dr. Samuel Hahnemann in 1790 and he first published it in Hufelands journal in 1796 (Dudgeon, 1995), Hahnemann prepared medicines from a wide variety of natural sources (Hahnemann Samuel, 1990). He introduced the principle of "Similia Similibus Curentur" (Hahnemann Samuel, 1993) (let likes be cured by likes) as the therapeutic law for the selection of medicines for patients, His therapeutic law did not attract many criticisms in the early days as he practiced homeopathy with material doses (Rajendran, 2013) (mother tinctures and grain doses) His later discovery of potentization (SumitGoel 2007) (infinitesimal dilutions) was an unprecedented giant leap forward in the field of medicine. He, initially discovered centesimal scale of potencies (Hahnemann Samuel, 2001) (1:100 between the drug material and the vehicle), and 50 millesimal scale (Rima Handley, 2007) (1:50000 between the drug material and the vehicle). Since these scales of dilutions do not confirm with the principles of material science, especially to Avogadro's number (KhudaBukhsh *et al.*, 2011), the method of preparation of homeopathic drugs discovered by Dr. Hahnemann was rejected

as unscientific and insignificant. The therapeutic efficacy consistently shown by homeopathic medication was branded as unbelievable (Paolo Bellavite and LuciettaBetti, 2012) or merely as psychological one. All along the scientific world was under equipped to prove or disprove the material content of homeopathic ultra-high dilutions. A new opportunity was open for the analysis only after the discovery, of Electron Microscope and the later, advanced techniques like EDS to identify the elementary composition of particles at nanoscale. Recently Iris R Bell *et al.* proposed that the trituration, dilution and succussion procedures in remedy preparation may actually be crude manual methods that generate "top down" nanoparticles of the source material (Iris R Bell and Gary E Schwartz, 2013). Chikramane *et al* demonstrated the presence of source material nanoparticles in homeopathic remedies of metallic origin in 6, 30 and 200 potencies (Chikramane *et al.*, 2010). *Aurummetallicum* (Hughes and Dake, 1995) is a commonly used homeopathic drug for about 200 years. It is used extensively for skin diseases, hypertension, depressive disorders etc. (Clarke, 1988). The initial potencies are prepared by trituration (Hahnemann Samuel, 1995) and the later potencies are prepared by the process of succussion (Dudgeon, 1994). As per Avogadro's number the theoretical possibilities of finding particles in the original drug material in potencies above 12C is nil. The researcher demonstrated the presence of nano particles in *Lycopodium* 6C- CM by using FESEM and

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EDS (Rajendran, 2015) and *Ferrummetallicum* 6C to 50M by using HRTEM and EDS (Rajendran, 2015). He further demonstrated the presence of nanoparticles in 13 drugsof various potencies, 6C to CM, LM1 to LM 30 (Rajendran, 2015).

MATERIALS AND METHODS

Samples and preparation

High resolution transmission electron microscope (HRTEM) (Pradeep, 2007) of Jeol TEM 2100 with operating voltage 200kV and 200 mesh carbon coated copper grid has been used. For EDS (Cobari *et al.*, 2008), Oxford Instruments INCA equipment has been used. Resolution of the HRTEM used has been 0.14nm. EDS (mode spot size varying from 0.5 nm to 25 nm), served to analyze the elementary composition of the identified NPs. Use of these equipment has helped to detect the NPs of smallest size and to analyze their elementary composition. *Aur met* 6C, 30C, 200C, 1M, 10M, 50M and CM with the dilution factor of 6C($1/10^{12}$), 30C($1/10^{60}$), 200C($1/10^{400}$), 1M($1/10^{2000}$), 10M($1/10^{20000}$), 50M($1/10^{100000}$) and CM($1/10^{200000}$) were used in the study. *Aur met* is prepared from 24 carat gold with sugar of milk. It is prepared initially in 1:10 ratio i.e. the decimal scale till 6X potency. After 6X this powdery medicinal material is converted in to liquid form by succussion (1:100) of the powder and dispensing alcohol (Homeopathic Pharmacopoeia of India, 1971).

RESULTS

The particle size of *Aurum met* 6C varied from 3 to 12nm (minimum to maximum). Majority of particles were within QD range. Individual particles in groups and island formations were seen. Mostly the particles were homogenous. Agglomerates were also seen. Presence of copper can be considered as originated from TEM grid. The presence of Na, Cl and K could be impurities. The particle size of *Aur met* 30C varied from 3 to 10nm. As in 6C, in 30C also there were individual particles forming groups from the Particle size was well in the QD side. Agglomerates were seen in the field. The presence of Al and Si may be due to impurities or the Si may be an effect of leeching from the glass container. The particles of *Aur met* 200C seem to be bigger than 6C and 30C, from 5 to 125nm. Mostly particles were seen in islands. Figure 6 is unique, which shows the presence of gold atoms as white spots in the TEM image. Other elements like Na, Cl, K and Cu were also seen. Particle size of *Aur met* 1M varies from 5 to 35nm. The larger particles are less in size compared to 200C. Figure 7 is unique with formation of fern leaf like patterns. This natural formations may be considered as fractals (William J Gilbert, 1982; Kress Mayer, 1986) Large number of elements were seen in *Aurum met* 1M other than gold. Similar conditions were also noted in *Ferrum met* 1M (Rajendran, 2015). The size of NPs of *Aur met* 10M varies between 25 to 50nm. The particles were seen individually as well as in isolated groups. They were sensitive to the energy emanating from electron beams on focussing and getting easily burned. Other than gold, Cu, Fe, B, and Co were also identified. The particle size of *Aur met* 50M varies from 5 to 80nm. As in *Aurum met* 10M, particles were seen in unique groups and they were easily burned on close focusing. The elements detected other than gold were almost similar to 10M i.e. Cu, Fe and Co. Particle size of *Aur met* CM varied from 7 to 100nm. Large number of particles was seen in isolation. The morphology of particles was also unique in *Aurum met* CM. Even in group formations, individual particles

were clearly visible. Other than Au, there was Cu, Fe, C, Hf and Co also seen. Particles in *Aurum met* CM were found more stable on close focussing compared to 1M, 10M and 50M.

Table 1. Elementary composition of NPs in various high dilutions of *Aur met*

Elements	<i>Aur met</i> 6C	<i>Aur met</i> 30C	<i>Aur met</i> 200C	<i>Aur met</i> 1M	<i>Aur met</i> 10M	<i>Aur met</i> 50M	<i>Aur met</i> CM
Au	2.88	89.66	12.14	2.10	6.61	9.73	6.58
Na	31.12		20.08				
Cl	28.32		12.62	3.22			
K	15.62		29.36	1.73			
Cu	22.06	10.34	25.80		28.23	53.27	35.56
Al				17.5			
Si				24.52			
O				21.05			
S				0.82			
Ca				6.98			
Fe				7.24	7.75	13.86	6.01
C				34.25			5.20
Sb				8.67			
Tb				5.50			
Hf				9.98			36.56
B					49.87		
Co					7.55	23.15	16.08

Table 2. Particle size of NPs in various high dilutions of *Aur met*

Potency	Particle size
<i>Aurum met</i> 6C	3 – 12 nm
<i>Aurum met</i> 30C	3 – 10 nm
<i>Aurum met</i> 200C	5 – 125 nm
<i>Aurum met</i> 1M	5 – 35 nm
<i>Aurum met</i> 10M	25 – 50 nm
<i>Aurum met</i> 50M	5 – 80 nm
<i>Aurum met</i> CM	7 – 100 nm

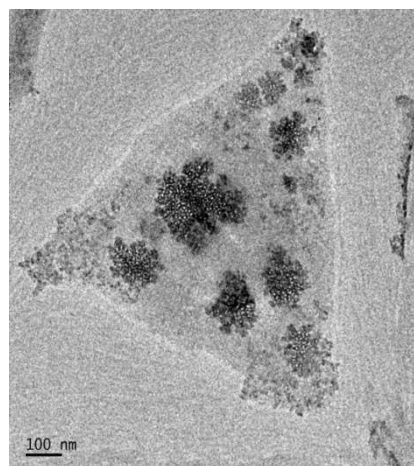


Figure 1. *Aur met* 6C under 100nm scale

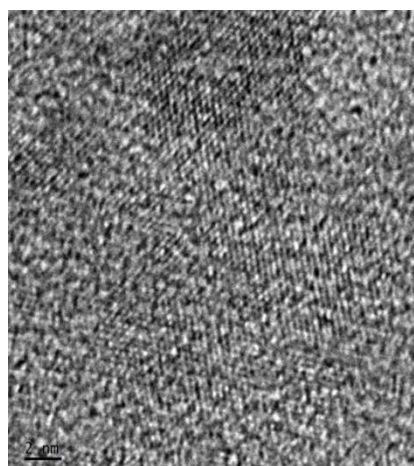


Figure 2. *Aur met* 6C under 2nm scale

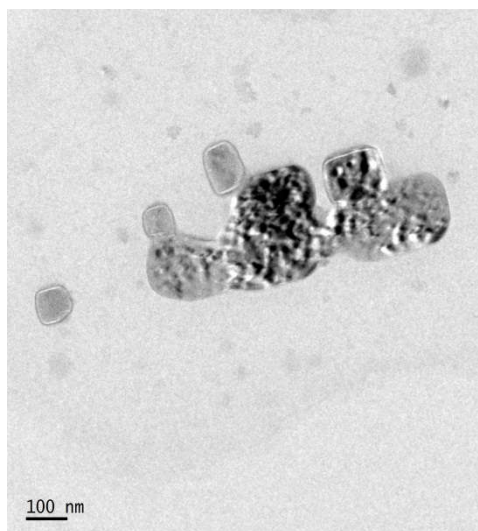


Figure 3. *Aur met 30C* under 100nm scale

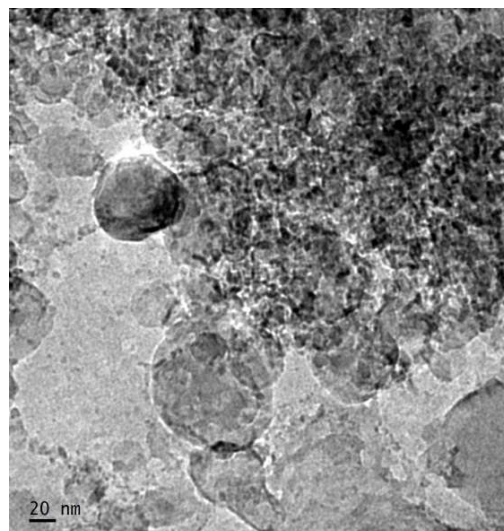


Figure 4. *Aur met 30C* under 20nm scale

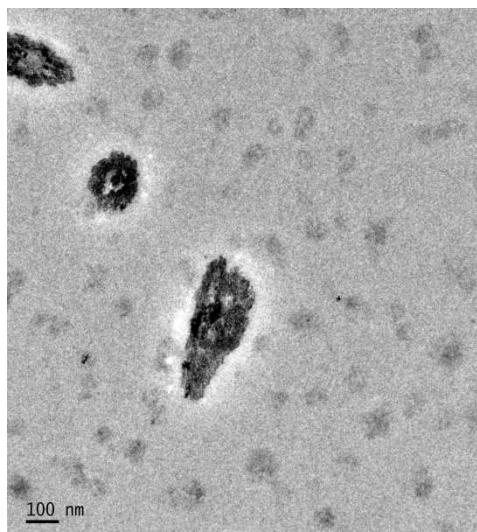


Figure 5. *Aur met 200C* under 100nm scale

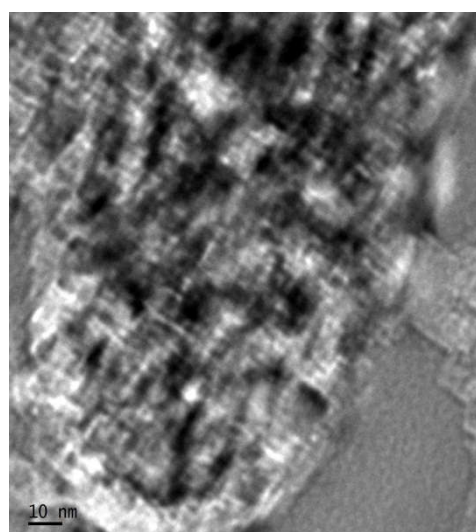


Figure 6. *Aur met 200C* under 10nm scale

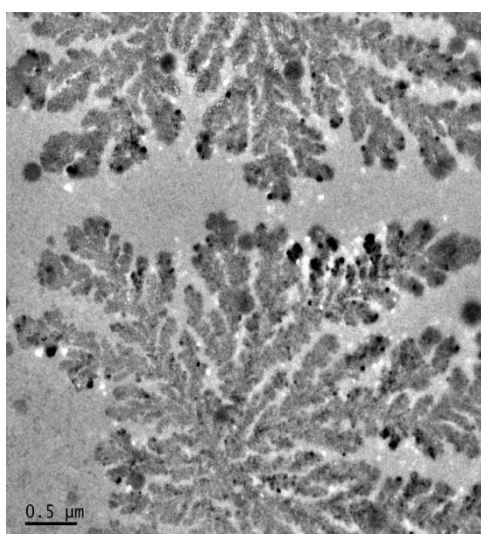


Figure 7. *Aur met 1M* under 500nm scale

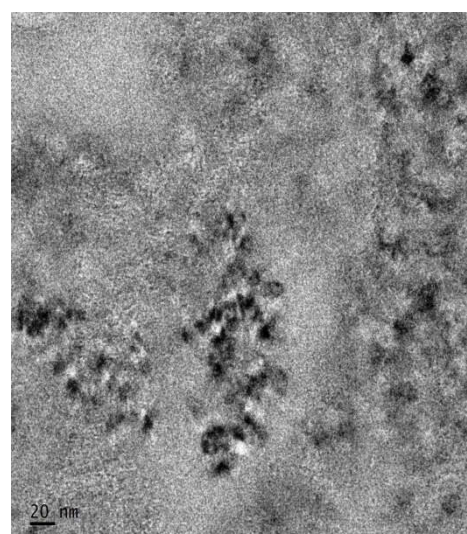


Figure 8. *Aur met 1M* under 20nm scale

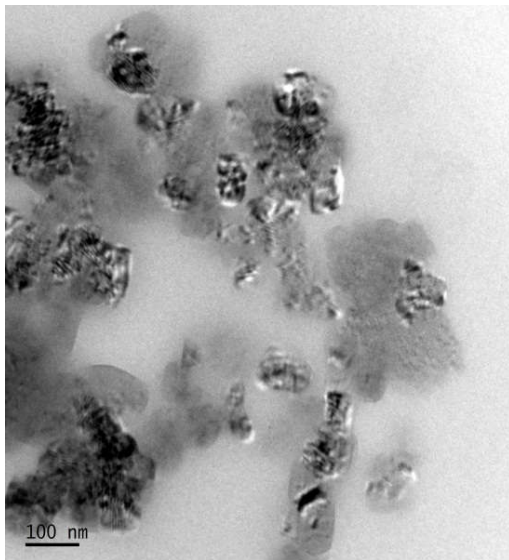


Figure 9. *Aur met* 10M under 100nm scale

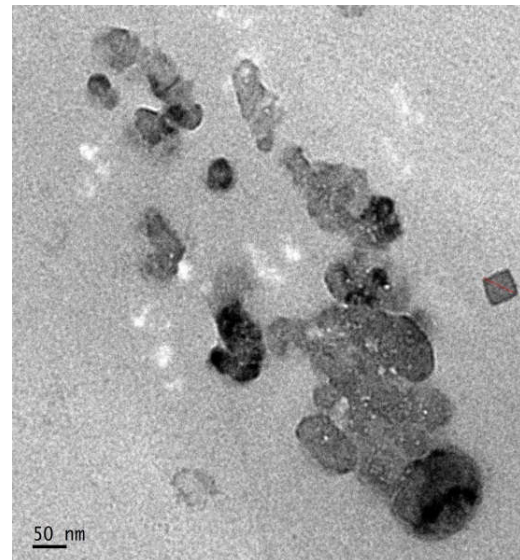


Figure 10. *Aur met* 10M under 50nm scale

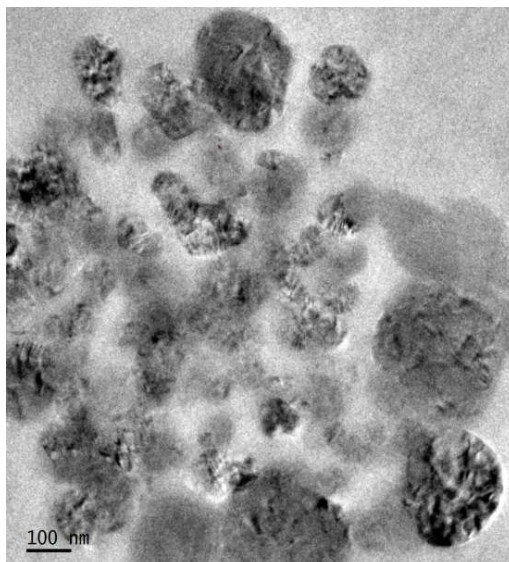


Figure 11. *Aur met* 50M under 100nm scale

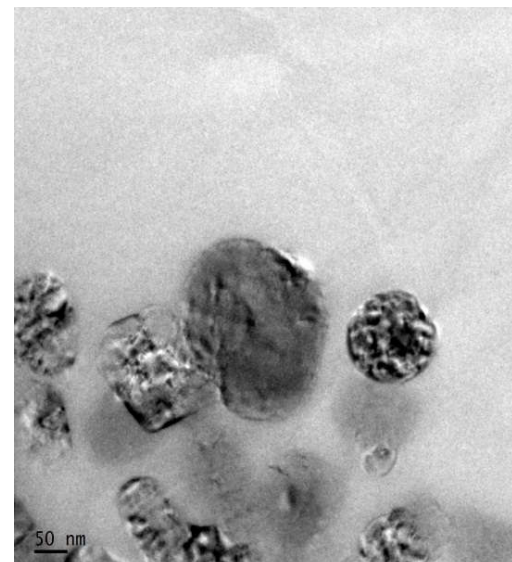


Figure 12. *Aur met*50M under 50nm scale

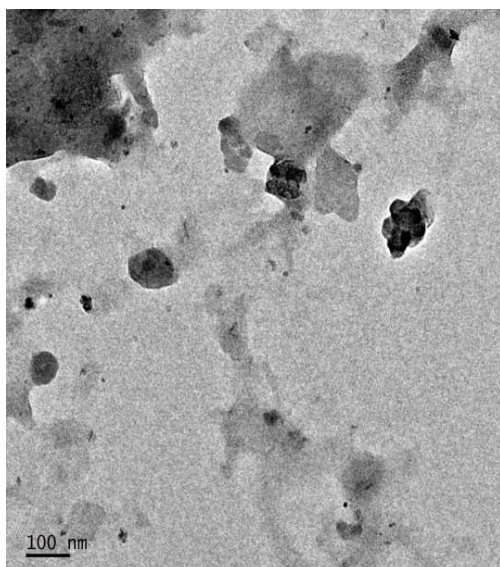


Figure 13. *Aur met* CM under 100nm scale

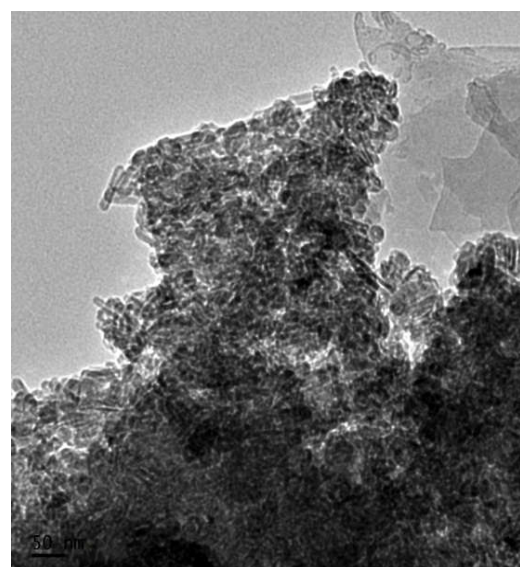


Figure 14. *Aur met* CM under 50nm scale

DISCUSSION

Dr Hahnemann declared Homeopathy as a dynamic (energy) (Haehl Richard, 1992) medicine due to the infinitesimal dilution (potentization) of drugs to a mind boggling level. There was no evidence to prove the material nature of homeopathic ultra-high dilutions and therefore the method proposed by the discoverer of Homeopathy in the preparation of drugs by serial dilutions and succussions may not retain the drug material in the medicinal solutions of high potencies. He hypothesised that the material content of drugs assumes an energy form in higher dilutions and act on the 'vital principle' of the human organisms, to initiate therapeutic activities. This was a plausible explanation in the context of 18th century. The study results of the author (Rajendran, 2015) prove the presence of NPs and QDs of the drug material in every ultra-high dilutions of homeopathic medicines from 6C to CM and LM1 to LM30.

Conclusion

The HRTEM and EDS analysis of all ultra-high dilution of homeopathic drug *Aurum met* shows

1. The presence of plenty of NPs especially QDs in all the potencies
2. Majority of particles seems to be in QD size (<10nm)
3. Particles contain Au (gold) in various weight percentage
4. Highest weight percentage of Au was seen in 30C potency
5. The presence of Cu, C and Hf seems to be the part of TEM analysis including TEM grid, hence may be ignored. Presence of other elements, even though infrequent, demands further studies.
6. Identification of NPs of Au in all potencies of *Aurum met* reject the present assumption that homeopathy is merely a hypothetical medicine without any material content in its medicinal solutions.
7. Identification of NPs of Au in all potencies of *Aurum met* proves that homeopathy is fundamentally a material science of nanoscale.

These findings are important and relevant because they take homeopathic system of medicine to scientific realms where it was denied entry hitherto.

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