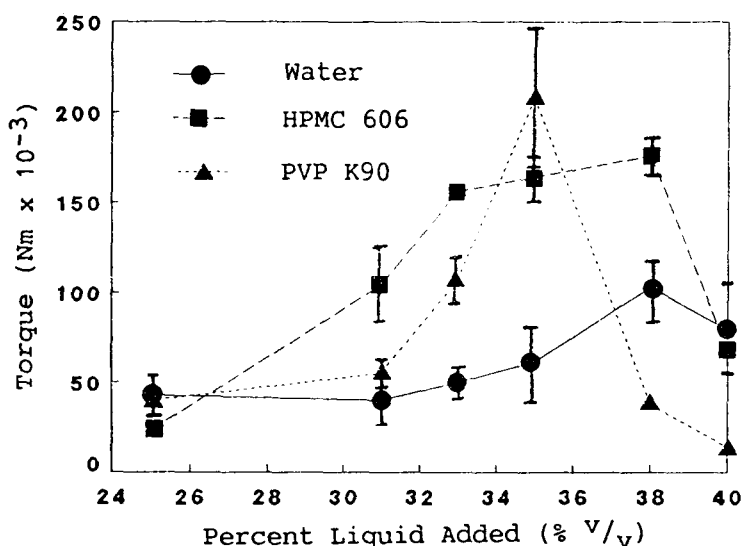


## WET GRANULATION INTERACTIONS IN A MODEL POWDER SYSTEM

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The use of a model powder system to study wet granulation is well documented (Butensky and Hyman 1971, Dingwall and Ismail 1976). Model systems are preferred because of their regular shaped particles and well defined size distributions. Recently Cutt et al (1986) showed differences in the properties of dried granules prepared from a model system, glass ballotini, and a number of commonly used polymer binding agents. The objective of the present study was to establish whether differences also exist in the wet massing behaviour of such systems.



The rheological behaviour of glass ballotini (median diameter 11  $\mu$ m) granulated with water and 5% w/v aqueous solutions of polyvinylpyrrolidone (PVP K90) and hydroxypropylmethylcellulose (HPMC 606) was monitored using a mixer torque rheometer (Parker et al 1990). Figure 1 shows the torque response of the powder/binder mixes as a function of the liquid content by volume. The data show that the addition of each liquid to the model powder results in a positive torque response due to the agglomeration of the powder particles. The response increases with increasing liquid content until overwetting occurs when a rapid fall in the measured torque is observed.

Fig. 1 Wet granulation torque profiles for model powder

The peak liquid contents correspond to the total void space found in a randomly packed bed of spherical particles and the total filling of this void space by a liquid is the capillary state of Newitt and Conway-Jones (1958). There is a larger torque response with the more viscous granulating liquids. Differences in the torque profiles generated with each polymer binder solution are apparent. Since many of the variables that affect wet granulation behaviour, notably binder viscosity, wet massing time and powder properties are constant, the rheological differences can be attributed to different molecular interactions at the powder/binder interface. The wetting of the solid by the binder solution and the relative strengths of cohesive and adhesive forces in and between the materials will play a critical part in such interactions. The results of Cutt et al (1986) have been explained by consideration of surface free energy parameters (Rowe 1989) and a similar approach can be used to explain the interactions occurring within the wet powder masses.

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