

# **Characterization of thermal and rheological properties of zidovudine, lamivudine and plasticizer blends with ethyl cellulose to assess their suitability for hot melt extrusion**

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## **Abstract:**

The influence of antiretroviral drugs and plasticizers on the rheological and thermal characteristics of ethyl cellulose formulations intended for hot melt extrusion has been investigated. Antiretroviral drugs used were zidovudine and lamivudine, whilst plasticizers included triethylcitrate (TEC) and polyethylene glycol (PEG-6000). Physical mixtures containing ethyl cellulose with varying concentrations of drugs and plasticizers were characterized using differential scanning calorimetry (DSC) and parallel plate oscillatory rheometry. The viscosity of physical mixtures containing both drugs was lower than observed for pure ethyl cellulose, indicating that the drugs had a plasticizing effect. This was confirmed by lowering of the glass transition temperature ( $T_g$ ) of ethyl cellulose. At the highest loading of 40% by weight, lamivudine appeared to become saturated within the polymer, causing an increase in viscosity and showing evidence of recrystallization upon cooling. Both TEC and PEG-6000 were found to lower the  $T_g$  of ethyl cellulose, although PEG-6000 recrystallized upon cooling which makes it unsuitable for use in the proposed controlled release formulations. Both plasticizers were also shown to reduce the viscosity of ethyl cellulose, more significantly so for TEC. The results indicate that ethyl cellulose formulations containing up to 40% by weight of zidovudine, not more than 30% by weight of lamivudine, with 5-10% by weight of TEC as the plasticizer are suitable for processing by hot melt extrusion.